U.S. Department of Transportation
Federal Highway Administration

FINAL REPORT

1996 ATLANTA CENTENNIAL OLYMPIC GAMES AND PARALYMPIC GAMES

EVENT STUDY

150160

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16. Abstract

The Atlanta metropolitan region was the location of one of the most ambitious Intelligent Transportation Systems (ITS) deployments in the United States. This deployment included several individual projects-a Central Transportation Management Center (TMC), six Traffic Control Centers (TCCs) one Transit Information Center (TIC), the Travel Information Showcase (TIS), and the extension of the Metropolitan Atlanta Rapid Transit Authority (MARTA) Rail network and the new high-occupancy vehicle (HOV) lanes on I-85 and I-75.

The 1996 Atlanta Centennial Olympic Games and Paralympic Games created a focus for these projects. All of these systems were to be brought on-line in time for the Olympic Games.

This report presents the findings of the 1996 Olympic and Paralympic Games Events Study-a compilation of findings of system performance, the benefits realized, and the lessons learned during their operations over the events period. The study assessed the performance of the various Travel Demand Management (TDM) plans employed for Olympic Games traffic management.

This intermodal system performance and benefits assessment also presents recommendations for other major special-event host cities and ITS deployments, based on the lessons learned from the Atlanta Centennial Olympic Games transportation operations.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
	AREA			
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yards	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
	VOLUME			
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
NOTE: Volumes greater than 1000 l shall be shown in m^3.				
	MASS			
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5(F-32)/9 or (F-32)/1.8	Celcius temperature	°C
	ILLUMINATION			
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
	FORCE and PRESSURE or STRESS			
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
	LENGTH			
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
	AREA			
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
	VOLUME			
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.71	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
	MASS			
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
	TEMPERATURE (exact)			
°C	Celcius temperature	1.8C + 32	Fahrenheit temperature	°F
	ILLUMINATION			
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
	FORCE and PRESSURE or STRESS			
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

* SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.

(Revised September 1993)

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LIST OF ACRONYMS

ACOG	Atlanta Committee for the Olympic Games
ADAS	Atlanta Driver Advisory System
AJC	Atlanta Journal Constitution
APC	Automated Passenger Counters
APD	Atlanta Police Department
APOC	Atlanta Paralympic Organizing Committee
APTS	Advanced Passenger Transportation Systems
ARC	Atlanta Regional Commission
ATC	Automatic Train Control
ATIS	Advanced Traveler Information System
ATMS	Advanced Transportation Management System
ATOC	Atlanta (APD) Traffic Operations Center
AVL	Automatic Vehicle Location
BA&H	Booz.Allen & Hamilton Inc.
BBS	Bulletin Board Service
BSMS	Bus Stop Message Signs
CBD	Central Business District
CCN	Commute Connections Network
CCT	Cobb Community Transit
CCTV	Closed-Circuit Television
CMS	Changeable Message Sign
DESS	Downtown Employees Shuttle Service
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GBI	Georgia Bureau of Investigation
GDOT	Georgia Department of Transportation
GEMA	Georgia Emergency Management Agency
GFI	General Farebox Incorporated
GIS	Geographic Information System
GOC	Games Operations Center

LIST OF ACRONYMS (Continued)

GSA	General Services Administration
GSP	Georgia State Patrol
HAR	Highway Advisory Radio
HERO	Highway Emergency Response Operators
HOV	High-Occupancy Vehicle
ILS	Integrated Logistics Systems
IMS	Incident Management System
IRC	Information Resource Center
IT1	Intelligent Transportation Infrastructure
ITS	Intelligent Transportation Systems
IVHS	Intelligent Vehicle Highway Systems
LED	Light-Emitting Diode
LOS	Loss of Signal
MARTA	Metropolitan Atlanta Rapid Transit Authority
MN	Metro Networks
MPO	Metropolitan Planning Organization
O&M	Operations and Maintenance
OSTS	Olympic Spectator Transportation System
OTIS	Olympic Transportation Information System
OTS	Olympic Transportation System
PARIS	Passenger Routing and Information System (a.k.a. Itinerary Planning)
PD	Police Department
PTS	Paralympic Transportation System
SOLEC	State Olympics Law Enforcement Command
SSCCC	Spectator System Command and Control Center
SSOT	Spectator System Operating Terminals
STIC	Subcarrier Traffic Information Channel

LIST OF ACRONYMS (Continued)

TATS	Traffic Advisory Telephone Service
TCC	Traffic Control Center (sometimes Transportation Command Center as in APOC)
TDM	Travel Demand Management
TIC	Transit Information Center
TIMS	Transportation Information Management System
TIS	(Atlanta) Traveler Information Showcase
TMC	Transportation Management Center
UL	Unlinked
VTM	Venue Transportation Manager

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

The Atlanta metropolitan region is the location of one of the most ambitious intelligent transportation system (ITS) deployments in the United States. The system links eight regional agencies and includes a transportation management center (TMC), six traffic control centers (TCC), and a transit information center (TIC). In addition, regional Advanced Transportation Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), and Advanced Public Transportation Systems (APTS) were installed.

The 1996 Atlanta Centennial Olympic and Paralympic Games created a focus for the projects. The gdal was to bring all of the new systems online in time for the games, to provide a positive transportation experience. The games also served as a focus for implementation of a regional transportation demand management (TDM) program, an extension of the area's express high-occupancy vehicle (HOV) lane system, and an extension of the Metropolitan Atlanta Rapid Transit Authority (MARTA) rail network.

ES.1.1 The Event Study and the Case Study

Booz.Allen & Hamilton (BA&H) was commissioned in May 1996 by the Federal Highway Administration (FHWA) to undertake an independent high-level review of the performance of the various ITS deployments and new infrastructure extensions, and to determine the technical, operational, and institutional lessons learned during the Olympic and Paralympic Games. This review is referred to as the Event Study.

A parallel study-the Atlanta Case Study-involves reviewing the lessons learned from ITS deployments in Atlanta over a longer period of time. The Case Study covers the period from 1990 until just prior to the games when most components were brought online. The Case Study has a separate final report.

ES.1.2 The Olympic and Paralympic Games

The Atlanta Olympic and Paralympic Games were the world's two largest sporting events in 1996, in terms of athlete and spectator attendance. The Atlanta Olympic Games were the largest summer Olympic Games ever held. A comparison of ticket sales indicates that the Atlanta Olympic Games attracted nearly as many paying spectators as the Los Angeles and Seoul (or Barcelona) Games combined. Average daily ticket sales were greater than 500,000 for the Atlanta Games (excluding tickets provided to the Olympic Family). This total also exceeds corresponding daily attendance at other major domestic sporting, political, and exhibition events that have been staged in Atlanta, by a factor of at least five. This is particularly significant since the Olympic Games lasted 17 days.

Perhaps the most significant aspect of the Atlanta Olympic Games was the location of the major sporting venues. Unlike the Los Angeles Games, most of the major sporting venues were located within the "Olympic Ring,"-a 2.4-km radius centered around downtown Atlanta. In addition to the major sporting venues, the Olympic Ring also contained the Olympic Village and the Centennial Olympic Park.

This combination of the size of the Olympic Games and concentration of games-related activities in downtown Atlanta sets the context for our assessment of the Olympic Games transportation experience.

ES.1.3 Travel Demand

Travel demand statistics covering freeway usage and transit ridership during the Olympic Games were collected by the Georgia Department of Transportation (GDOT) and MARTA.

ES.1.3.1 Freeways

The **24-h** total daily traffic flows on the radials (I-75, I-85, and I-20) were down 4 to 6 percent. The I-75/1-85 connector 24-h traffic flows were about the same, but with a different vehicle mix-more buses than usual. The I-285 perimeter recorded **more travel** than usual, up 4 to 11 percent, probably **due** to the restriction of trucks entering the downtown connector during **the** Games period. Commute peak periods were **more** spread out than normal weekdays, and the peak flows were up to 30 percent less than on normal weekdays.

ES.1.3.2 Transit

On an average weekday during the Olympic Games, MARTA Rail carried more than four times its normal daily ridership. On the busiest days, rail ridership was more than five times normal daily demand. It is **known** that many riders used MARTA Rail without being counted at the faregate: ticket holders were allowed to pass through the opened handicapped entrance gates during heavy demand periods. There was no way of counting these ticket holders. Therefore, actual ridership levels were higher.

Ridership on scheduled MARTA Bus services decreased by nearly 20 percent during the Olympic Games. As with MARTA Rail services, not all passengers were counted on MARTA Bus services. Therefore, actual ridership levels were higher. The Olympic Games spectator bus shuttle system carried more than 1.5 times the ridership carried by MARTA Bus on an average weekday.

The implications of these travel demand statistics on the Event Study are important. Freeway and scheduled MARTA Bus travel demands during the Olympic Games were generally close to normal levels, albeit with modified travel patterns. This was not the case for MARTA Rail, which was subject to significantly higher levels of demand than normal.

ES.1.4 Event Study Approach

The approach adopted for the Event Study is summarized in Figure ES-l. A high-level assessment was conducted of the performance of a wide range of the ITS deployments, agency and user perceptions were gathered, and interagency coordination was observed. Data collection was restricted (by the scope of this work) to the Olympic and Paralympic Games period only. There was no opportunity to conduct any before/after type analysis.

ES.2 LESSONS LEARNED AND RECOMMENDATIONS

The Event Study focused on the transportation operations during the Olympic and Paralympic Games. Lessons learned and recommendations are presented from a **local Atlanta perspective and** from a wider national perspective. The latter relates to both event management and routine transportation operations.

ES.2.1 Target Audience

Each recommendation identifies the agencies affected. As GDOT was the lead agency for the Atlanta ITS deployments, many of the recommendations with a local Atlanta perspective are targeted at **GDOT. Recommendations are made for routine** transportation **operations only. No recommendations are made for event** management. These are considered to have minimal applicability from an Atlanta perspective, since major events such as the Olympic Games will most likely be held elsewhere in the foreseeable future.

Event management recommendations with a national perspective are predominantly targeted at affected state and local agencies and event organizers. Routine transportation operations recommendations with a national perspective are predominantly targeted at FHWA and the Federal Transit Administration (FTA), reflecting their respective roles as funding agencies.

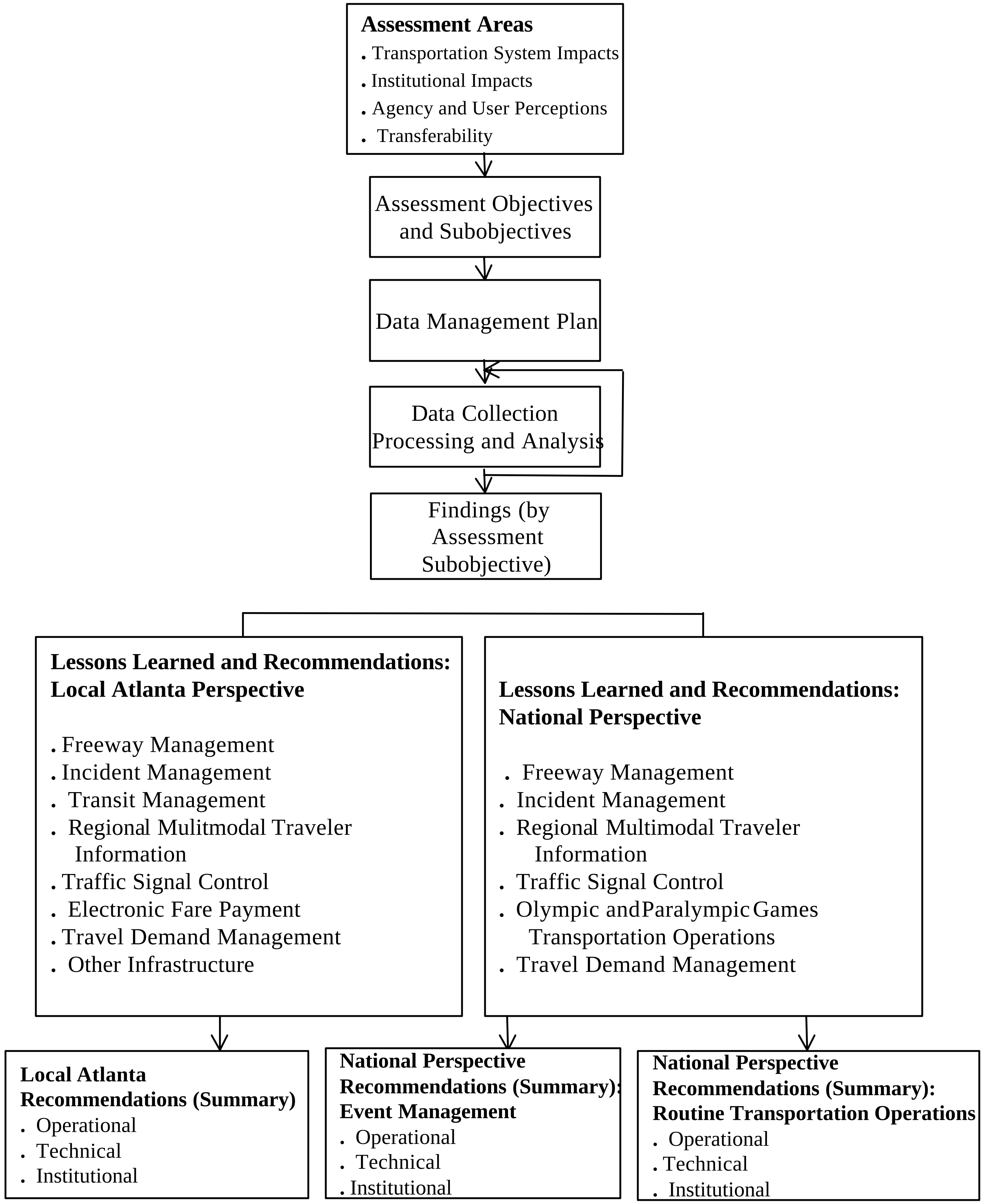


FIGURE ES-1. Assessment Approach

Lessons learned and recommendations are summarized in the following tables, covering technical, operational, and institutional areas. The technical area includes recommendations relating to systems, services, and plans. The institutional area includes recommendations that focus on interagency coordination, interagency operational barriers, team building, and communications. The operational area includes recommendations relating to the development of operations planning and training.

ES.2.2 Local Atlanta Perspective

From a local Atlanta perspective, 18 recommendations are identified. Ten are related to incident management alone.

TABLE ES-l. Technical Considerations: Local Perspective

Report Section	Lesson Learned	Recommendation
3.3.1.4 3.3.3.1 3.3.3.2	Traffic surveillance devices and field patrols were intentionally concentrated on freeways inside the I-285 perimeter during the games, but this may not be the most optimal deployment plan for post-games operations.	GDOT should review its Highway Emergency Response Operator (HERO) deployment plans and assess the need for and location of additional field devices, such as closed-circuit television (CCTV) cameras and Changeable Message Signs (CMS).
3.3.1.1 3.3.1.3	The ATMS does not currently possess the ability to monitor operator performance. Their impact on incident management, the impact of the system, and improvements gained from future enhancements of the system cannot be measured at present.	GDOT should enhance the ATMS software to allow tracking of operator performance.
3.3.1.2 3.3.2.5 3.5.1 .1	In general, the ATMS was well received in terms of its capabilities and user-friendliness. One area identified as needing enhancement was icon placing. Icon placing is time-consuming, even for a skilled operator.	GDOT should review the icon placement process of the incident management system (IMS), to determine if hardware or software changes can further improve speed.
3.3.4 3.5.1.3 3.5.5.2	There were clear indications during the games that ITS technologies offered the potential to enhance transit management. But, it was noted that the APTS components required more time to be fully deployed and undergo shakedown before they could be fully assessed.	FHWA and FTA, in conjunction with local agencies, should assess the performance of the APTS components, after a comprehensive shakedown period.
3.5.1.3 **3.5.5.1**	The games period only allowed a preliminary investigation of the role of ATIS components.	FHWA and FTA, in conjunction with local agencies, should assess the ATIS components, after a comprehensive shakedown period.

TABLE ES-1. (Continued)

Report Section	Lesson Learned	Recommendations
3.5.5.2	The role of the National Bank, First Union, Wachovia/Visa smartcard as a transit fare medium was limited by the free access permitted to MARTA public transit facilities for spectators with a valid venue ticket. In addition, existing MARTA farecards offered discounts not available with the use of the smartcard.	If the smartcard is considered for full-scale implementation, FHWA and FTA, in conjunction with MARTA and GDOT, should assess the potential role of smartcards alongside other fare payment media during normal travel conditions.
3.5.2.2 3.5.5.2 3.6.3	Little is known regarding the long-term impacts of the Commute Connections Network (CCN)program and the extent to which the Atlanta ITS deployments can facilitate these.	The Atlanta Regional Commission (ARC), in conjunction with local agencies, should assess the long-term impacts of expanding the CCN program.
3.3.7	While public attitudes toward HOV lanes were positive, the impact of the HOV lanes during the games was neutral.	GDOT and ARC should consider ways in which the post-games use of HOV lanes can be enhanced.
3.3.4 3.3.8 3.5.1.3 3.6.3	Little is known about the overall impact of the North Line Extension on travel patterns in the Atlanta metropolitan area.	MARTA and ARC should assess the long-term impacts of the North Line Extension

TABLE ES-2. Operational Considerations: Local Perspective

Report Section	Lesson Learned	Recommendation
3.3.1.3	During the game period, there were indications of improving trends in incident clearance times. However, the data collection duration was insufficient to assess fully the impact of incident management operations.	GDOT should commence an ongoing analysis of incident clearance times.
3.3.1.4	Overall, the performance of the GDOT HEROs was impressive. However, working on freeways next to traffic lanes is an unforgiving environment for those who do not remain alert, even for well-trained HERO crews.	Because of the risks inherent in incident management activities, GDOT HERO operations should incorporate additional training emphasizing ongoing sensitivity to these factors.
3.3.1.4	At the present time, no quantitative means exist to determine the optimum deployment of GDOT HEROs	GDOT should implement measures to monitor HERO performance.
3.3.2.1 3.4.1.3 3.5.1.1	The IMS was an effective tool at the locations where it was available during the games. It will be a more powerful tool when its coverage is complete.	GDOT, in conjunction with other local agencies, should complete the library of response plans and the associated training of operator.
3.3.2.1	During some level II or higher incidents, TMC operators implemented response plans manually, even though the IMS can generate appropriate response plans automatically for these incidents.	GDOT should review procedures for terminating level II and higher incidents when they are moved to the shoulder.

TABLE ES-3. Institutional Considerations: Local Perspective

Report Section	Lesson Learned	Recommendation
3.3.1.5 3.4.1.3 3.4.2.1 3.4.2.2 3.5.1 .l 3.5.1.2 3.5.1.3	Examples of interagency coordination were observed during the games. However, without a new interagency approach to handling major freeway incidents, an approach involving both office and field-based staff, the full benefit of the ATMS will not be achieved.	FHWA, FTA, GDOT, ARC, the city of Atlanta, MARTA, and other local agencies should pursue and implement an integrated, multiagency approach to incident management operations.
3.3.2.2	Loss of accessibility to the IMS can adversely affect credibility of the TMC among operators at the MARTA TIC.	GDOT, in conjunction with other local agencies, should facilitate periodic team communications by creating a bulletin board or similar system.
3.3.1.7 3.3.2.3 3.3.4.1 3.4.1.2 3.5.1.3	The potential exists for even greater exchange of traffic information between TMC and MARTA, and between MARTA and the TCCs, when the TCCs become fully operational.	GDOT and MARTA, in conjunction with other local agencies, should explore ways in which transit operations information can be used for freeway and surface-street management.
3.4.1.3 3.5.1.2	Even when the ATMS **is** fully functional, it may be unable to achieve its full potential without agreements between GDOT and other transportation and incident management agencies.	In conjunction with other local agencies, GDOT should develop agreements for control of non-GDOT signals.

ES.2.3 National Perspective-Event Management

From a national perspective, 13 event management recommendations are made.

TABLE ES-4. Technical Considerations: Naional Perspective, Event Management

Reports Section	Lesson Learned	Recommendation
3.5.4	While different agencies provide information on various services, sometimes the public cannot easily determine which agency to call for a specific type of information.	Local agencies and event organizers should jointly develop a "transportation information one-stop shopping" telephone information line with automatic transfers to appropriate agencies, not just to the event organizer. This is particularly important for the successful organization of major special events such as the Olympic Games.

TABLE ES-4 (Continued)

Report Section	Lesson Learned	Recommendation
3.3.1.1 3.3.2.2 3.3.2.3 3.4.2.2 3.5.1 .l 3.5.1.2 3.5.1.3 3.5.5.2	Many components were either not fully operational or non-operational during the games. Most operational components were undergoing shakedown during the first week of the Olympic Games.	FHWA, FTA, and local agencies should develop contingency plans for ITS deployments associated with event management, to ensure that alternate means exist to provide event management services when an immovable deadline cannot be met.
3.4.1 .1	During the games, no single agency was responsible for the integrated operation of pedestrian and bus movements.	Major event organizers and local agencies should plan for large numbers of pedestrians using traffic lanes.
3.5.4.5	Management of venue transportation operations is a challenging “front-line” role, frequently involving coping with unexpected events and requiring good communications with spectators and staff.	Event organizers and local highway and transit agencies should consider how the management of venue transportation operations can support special events.
3.5.2.1	During the Olympic Games, rail ridership was higher than forecast.	Local agencies and event organizers should develop forecasts for event travel demands that include a range (low, medium, and high) for each mode. Operational plans should be drawn up for the range with the highest occurrence probability. Contingency plans should be drawn up to meet extreme levels.
3.5.2.1	Forecasting is an inexact science. It depends as much on **the** interpretation of the outputs as on the outputs themselves. Understanding the sensitivity of the forecasts to the assumptions on which they are based is essential.	Local agencies and event organizers should analyze the forecasts and assumptions developed prior to operations planning.

TABLE ES-5. Operational Considerations: National Perspective, Event Management

Report Section	**Lesson Learned**	**Recommendation**
3.3.7 3.5.2.2	GDOT successfully implemented specific traffic management measures in support of its objective to facilitate smooth and safe traffic flow on critical sections of the freeway system during the Olympic Games.	Well in advance, local agencies and event organizers should implement special traffic management measures where appropriate, to support the overall objectives of event management.
3.4.1.2	Where centralized control of traffic signals is not available, field signal operations teams can be very effective in making quick changes to signal timing plans **to** meet event flow needs. However, this will require reasonably accurate traffic demand forecasts.	In the absence of centralized traffic signal control, local agencies should develop a quick-response action plan to respond to real-time traffic flow needs during major events.

TABLE ES-5. (Continued)

Report Section	Lesson Learned	Recommendations
3.5.6	The media can play a valuable role in dissemination of traveler information and can strongly influence public perception-often adversely.	During major events, local highway and transit agencies and event organizers should disseminate timely and accurate transportation information through a combination of media sources and ATIS technologies, to achieve widespread coverage.
3.5.2.2 3.5.6	During major events, the traveling public can be persuaded to use transit in large numbers and to adopt austere driving practices, through a variety of measures.	Local agencies and event organizers should develop a coordinated TDM approach for major events. This will mitigate congestion and reduce operational expenditures for the public and the agencies
3.5.2.3 3.6.3	During the Atlanta Olympic Games, it was clear that the needs of the trucking and rail freight industry could be accommodated through prior planning and interagency cooperation.	Local agencies and event organizers should develop a coordinated approach to freight fleet management for major events. Such plans have a high potential to be successful.

TABLE ES-6. Institutional Considerations: National Perspective, Event Management

Report Section	Lesson Learned	Recommendation
3.5.4	In Atlanta, Olympic Spectator Transportation System (OSTS) operators control was split between the Atlanta Committee for Organizing the Games (ACOG) and MARTA. Conflict developed because ACOG wanted decisionmaking control of	Special-event transit operations should be managed under a single organizational umbrella where feasible, preferably with the existing conditions

ES.2.4 National Perspective-Routine Transportation Operations

From a national perspective, six recommendations are made for transportation operations.

TABLE ES-7. Technical Considerations: National Perspective, Routine Operations

Report Section	Lesson Learned	Recommendations
3.3.1.4 3.3.3.1 3.3.3.2	Selecting an optimal mix on field devices and safety service patrol resources requires judgement to balance the desired functionality and budget. Consideration must also be given to factors such as system integration, operations, and maintenance.	To support individual agencies decision making processes, FHWA and FTA should coordinate the development of guidance for the deployment of field devices and safety service patrol resources.
3.5.2.2 3.5.4.3 3.5.5.1	Selecting an optimal mix of traveler information systems (traditional and ATIS) requires judgement to balance the desired functionality and the budget. Consideration must also be given to such factors as system integration, operations, and maintenance.	To support individual agencies decision making processes, FHWA and FTA should coordinate the development of guidance for the deployment of traveler information systems.

TABLE ES-8. Operational Considerations: National Perspective, Routine Operations

Report Section	Lesson Learned	Recommendations
3.5.11 3.5.1.2 3.5.1.3	Agencies planning ITS deployments would benefit from understanding the training requirements for such systems, including type and duration of training needed.	FHWA and FTA should coordinate the development of guidance for ITS operational training requirements, to support state and local development.

TABLE ES-9. Institutional Considerations: National Perspective, Routine Operations

Report Section	Lesson Learned	Recommendations
3.3.1.3 3.3.1.4	The Atlanta regional ATMS does **not** currently possess the capability to monitor automatically the effectiveness of incident management. Similarly, the ATMS cannot be used to evaluate automatically the performance of the GDOT HEROs or to measure their impact on incidents.	Local agencies should design ITS deployments to monitor automatically any improvements in incident management (or other services as appropriate).
3.3.1.5 3.3.1.6 3.4.2.1 3.4.2.3 3.5.1.1 3.5.1.2 3.5.1.3	Relationships between agencies improved with the planning and implementation of the ATMS system, and staff were enthusiastic about its capabilities. However, it was apparent that the full benefit of the system would not be realized without more interagency coordination, involving office and field-based operations staff.	Local agencies should ensure that the design of ITS deployments takes into account the requirements of all agencies wishing to participate actively, while leaving the option for additional agencies to come onboard at a later stage. Agency needs must be considered during the conceptual design stage.

TABLE ES-9 (Continued)

Report Section	Lesson Learned	'Recommendation
3.3.1.6 3.3.2.2 3.3.4.1 3.5.1.2 3.5.1.3	Incident management and general transportation operations can be enhanced by the shared use of technology, such as radio reports from bus operators and observation of traffic conditions using CCTV cameras.	FHWA and FTA should jointly promote the concept of shared use of technology and information between highway and transit agencies.

ES.3 ACCOMPLISHMENTS AND CONCLUSIONS

ES.3.1 Accomplishments

The components assessed as part of the Event Study were developed over a period of years by eight local agencies in conjunction with the Atlanta Regional Commission (the local Metropolitan Planning Organization), FHWA, and FTA. This represents a major accomplishment in terms of the components themselves and the degree of interagency coordination commitment required to achieve it. Components included a range of ITS deployments, transportation network enhancements, freeway service patrols, and travel demand management measures. In addition to this legacy, the Olympic Transportation System provided transportation services for an estimated 25 million passengers during the 17-day period of the Olympic Games.

ES.32 Conclusions

The Olympic and Paralympic Games presented a unique opportunity to assess the performance of one of the most comprehensive ITS deployments in the United States. The lessons learned and recommendations developed provide insights that should be of interest to those with an ongoing involvement in the Atlanta ITS deployment, other cities and states contemplating new or expanded ITS deployments, and cities that will be hosts for upcoming events such as the 2002 Winter Olympic Games in Salt Lake City, Utah. The primary conclusions can be characterized as follows:

- ITS technologies can have a positive impact on incident management, and they offer the potential for future improvement in the area of traffic and transit management, and traveler information.
- New Federal guidelines are needed to support the decisionmaking process for selecting field devices, traveler information systems, and training programs.

- There is an ongoing need for the assessment of ITS technologies in Atlanta, where possible future deployment should be designed to facilitate performance monitoring.
- Training needs should be addressed at an early stage to ensure that they are adequately met before an event. Achievable goals should be set for ITS deployments in connection with a major event.
- Interagency coordination is a prerequisite for ITS deployments that cross institutional boundaries. Adequate time must be provided for agencies to develop working relationships.

1.0 INTRODUCTION

The Atlanta metropolitan region is the location of one of the most ambitious intelligent transportation system (ITS) deployments in the United States. The system includes a transportation management center (TMC), six traffic control centers (TCC), and a transit information center (TIC), linking eight regional agencies. In addition, regional Advanced Transportation Management Systems (ATMS), including incident management, regional Advanced Traveler Information Systems (ATIS), and Advanced Public Transportation Systems (APTS), were installed. The 1996 Summer Olympic and Paralympic Games held in Atlanta created a focus for the projects. The goal was to bring all of the new systems online in time for the games. The games also served as a focus for regional transportation demand management (TDM) planning, an extension of the area's express high-occupancy vehicle (HOV) lane system, and an extension of the Metropolitan Atlanta Rapid Transit Authority (MARTA) rail network.

This section describes the purpose and structure of the Final Report, provides an overview of the study, describes the transportation context of the Atlanta region, and provides an overview of ITS and other 'deployments in Atlanta.

1.1 PURPOSE AND FINAL REPORT STRUCTURE

Booz.Allen & Hamilton (BA&H) was commissioned in May 1996 by the Federal Highway Administration (FHWA) to undertake an independent, high-level review of the performance of the various ITS deployments and new infrastructure extensions, and to determine the technical, operational, and institutional lessons learned during the Olympic and Paralympic Games. This review was referred to as the Event Study. The study included an assessment of the effectiveness of ITS transportation management components and infrastructure deployments. Through a combination of observations, interviews, focus groups, surveys, monitoring, and a workshop, the Event Study generated a series of performance findings. From these, lessons learned and corresponding recommendations, which are relevant to other major special events and ITS deployments in Atlanta and other locations, were developed.

A parallel study, the Atlanta Case Study, involved reviewing the lessons learned from ITS deployments in Atlanta over a longer period of time. The Case Study covered the period from 1990 until just prior to the games when most components were brought online. There is a separate Final Report for the Case Study.

This Final Report presents the findings of the 1996 Olympic and Paralympic Games Event Study. The purpose of the Event Study was to assess the role of ITS and other deployments in the management of special event travel demands.

Special events, such as the Olympic Games, serve as scenarios of “high demands,” providing good test beds for ITS and other congestion mitigation implementation.

The Event Study makes specific recommendations to assist public and private agencies considering ITS deployment. The potential beneficiaries of the Event Study are: Federal Highway Administration (FHWA), Federal Transit Administration (FTA), metropolitan planning organizations, state and local agencies, and public transit agencies.

This report on the Event Study has four major sections:

- Introduction.
- The Olympic and Paralympic Games.
- Findings.
- Conclusions.

In addition, the Introduction contains the following, which includes information from the Case Study as well as the Event Study:

- Overview: Event Study and Case Study.
- The Transportation Context.
- ITS Deployments Overview.
- Other Transportation Infrastructure.

Figure l-l illustrates the general workflow for the Event Study and the Case Study.

A separate effort, the Olympic Spectator Transportation System (OSTS) Management, Operations, and Maintenance Review Study is being prepared by Booz-Allen & Hamilton (BA&H) for the FTA. This will be a more detailed evaluation of the OSTS than the Event Study.

1.2 OVERVIEW: EVENT STUDY AND CASE STUDY

While the Final Report principally addresses the Event Study, this overview covers both the Event Study and the Case Study, for completeness.

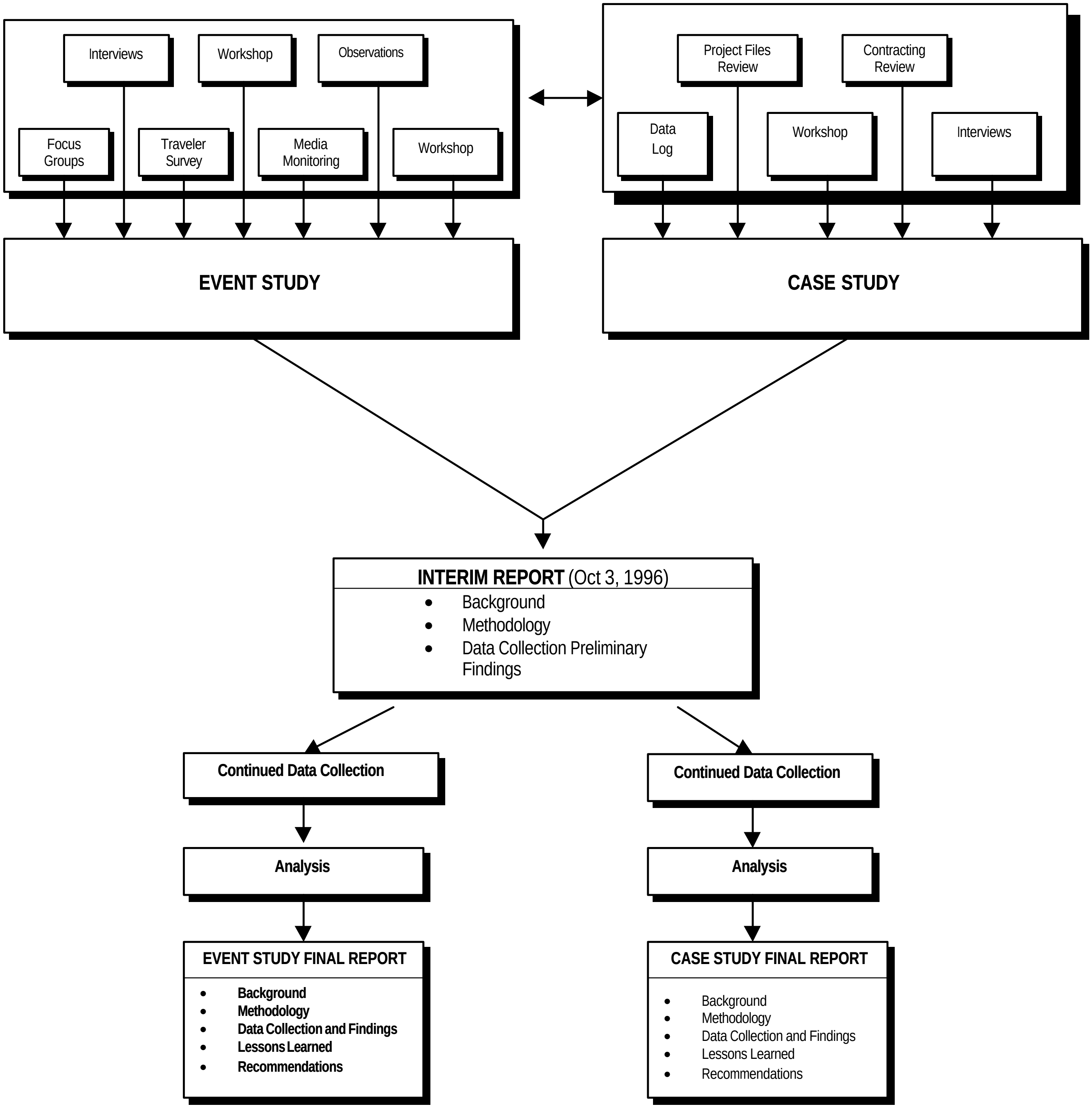


FIGURE 1-1. Event Study and Case Study Work Flow

1.2.1 Event Study

The key components of the Event Study were:

- Commentary on the size of the Olympic and Paralympic Games, in relation to other events.
- Documentation of effectiveness of the events' transportation management plans—target versus actual outcomes.
- Lessons learned—technical, operational, and institutional.

- Evaluation of the effectiveness of transportation management components, incident management, Georgia Department of Transportation's Highway emergency Response Operators (GDOT HEROs), APTS, ATIS, express (HOV) lanes, and TDM.
- Recommendations that may be applied to other locations, for ITS deployment and the staging of special events.
- Workshops and presentations on the transportation experience at the Olympic and Paralympic Games.

1.2.1.1 Event Study Scope

The scope of the Event Study essentially limited data collection to the duration of the Olympic and Paralympic Games. This prevented any "before and after" comparisons against baseline conditions. The Event Study considered performance against expectations, where such expectations existed, and sought to learn technical, operational, and institutional lessons that might be applied elsewhere, particularly where Federal funds may be used for similar systems or events. The detailed methodology adopted for the Event Study is presented in Section 3 of this report.

1.2.2 Case Study

The key components **of the Case Study were:**

- History of Atlanta transportation operational improvements-a timeline describing key events and the relationships among them.
- **Lessons learned from the Atlanta** experience-technical, operational, and institutional.
- The "ideal world," a description of how ITS deployment could have been accomplished more efficiently and effectively.
- Recommendations on how the ITS deployment experience could be disseminated to various audiences, ranging from Congress to the traveling public, using workshops, presentations, videos, etc.

1.2.2.1 Case Study Scope

The Case Study sought to learn lessons from each agency involved in the following aspects of the various ITS deployments in Atlanta between 1990 and the present:

- Technical design.
- Development.

- Implementation.
- Institutional issues.
- Challenges overcome.
- Funding related issues.

Lessons learned may be applied elsewhere, particularly where Federal funds may be used for similar systems. Data collection primarily involved document research and interviews with key staff at each agency involved.

The Case Study addressed the five major ITS projects, and two infrastructure projects that were deployed during the buildup to the Olympic Games:

- **Atlanta Regional ATMS:** A fully integrated transportation management system that includes incident management and traveler information.
- **Atlanta Traveler Information Showcase (TIS):** Information services for individual travelers during the games.
- **ITS MARTA '96:** Public transportation improvements using various technologies.
- **Atlanta Kiosk Field Operational Test (FOT):** A system that provides information **to travelers using** a network of 100 kiosks (during the Olympic Games period) in Atlanta and statewide.
- **Atlanta Driver Advisory System (ADAS) FOT:** A system that was planned to provide information to 100 Federal Express and 100 GDOT vehicles within the Atlanta metropolitan area through in-vehicle devices. (This test was not operational during the games.)
- **Express (HOV) Lanes:** Infrastructure improvement for increased capacity on urban freeways.
- **North Line Extension:** MARTA Rail extension into Atlanta's northern suburbs, with three new intermodal rail stations.

These projects are described more fully in Sections 1.4 (ITS projects) and 1.5 (non-ITS projects).

1.3 TRANSPORTATION CONTEXT

1.3.1 The Atlanta Metropolitan Region

The Atlanta metropolitan region comprises a ten-county area (Figure 1-2) which has seen sustained population and employment growth since 1970. The growth has pushed the edges of the urbanized region further out from the city. The proportion

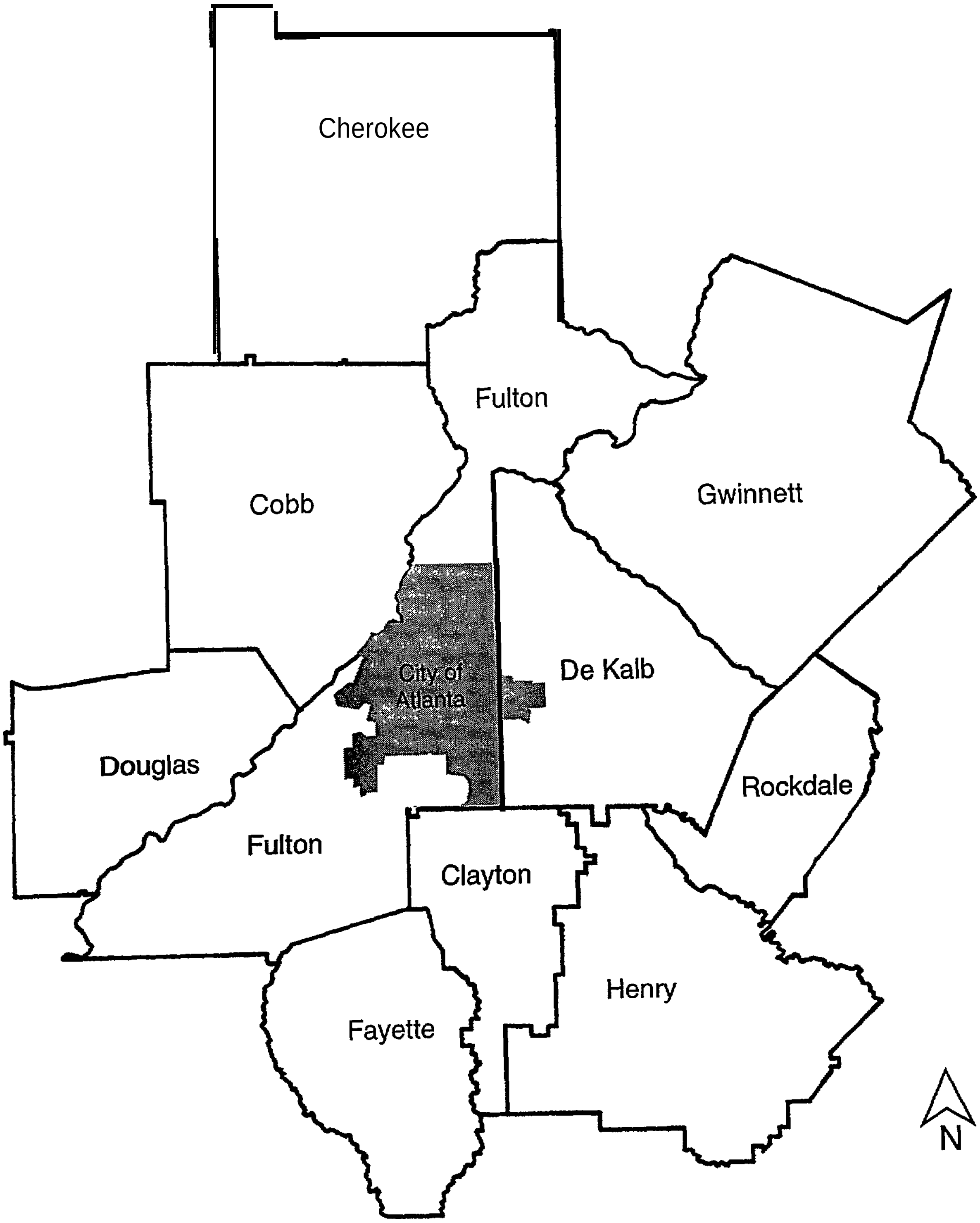


FIGURE 1-2. The Atlanta Metropolitan Region

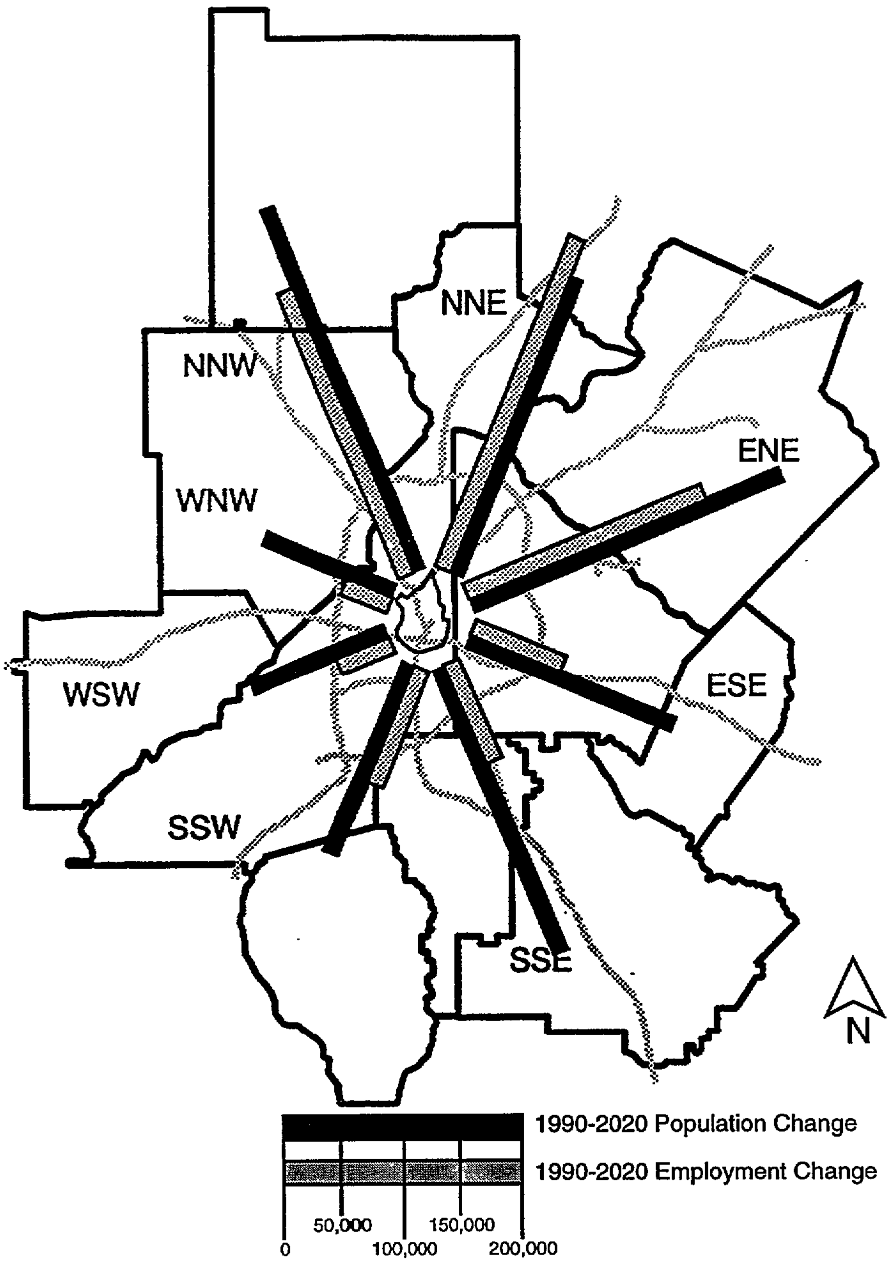
of the region's population residing in the city and the inner five counties (Clayton County, Cobb County, De Kalb County, Fulton County, and Gwinnett County) has steadily declined, while the outer ring counties (Cherokee, Douglas, Fayette, Henry, and Rockdale) have experienced corresponding population increases. Employment growth has followed similar trends.

This growth trend is forecast to continue through the first decades of the next century, with much of the growth directed to the north of the city (Figure l-3). Figure l-4 provides current and forecast regional population and employment levels. Between 1990 and 2010, the region's population is forecast to grow at nearly 2 percent per year, resulting in a 41 percent increase. Population growth is forecast at 1.5 percent per year between 2010 and 2020. The population residing in the city is expected to decrease slightly (by about 10,000 persons) between 1990 and 2010, and to remain relatively stable until 2020. In 1990, the city of Atlanta comprised about 16 percent of the region's population. In 2010, it is forecast to comprise 11 percent of the region's population.

Regional employment is also forecast to grow at about 2 percent per year between 1990 and 2010, and more than 1 percent annually between 2010 and 2020. Job growth is expected to occur throughout the region, with much of the increase forecast for the northern counties. The forecast growth will result in a shift in the proportion of regional jobs located within the city. In 1990, about 28 percent of the region's jobs were in the city; the forecast for 2010 is 19 percent. Jobs within the city's borders are expected to decrease at about 1 percent per year between 2010 and 2020.

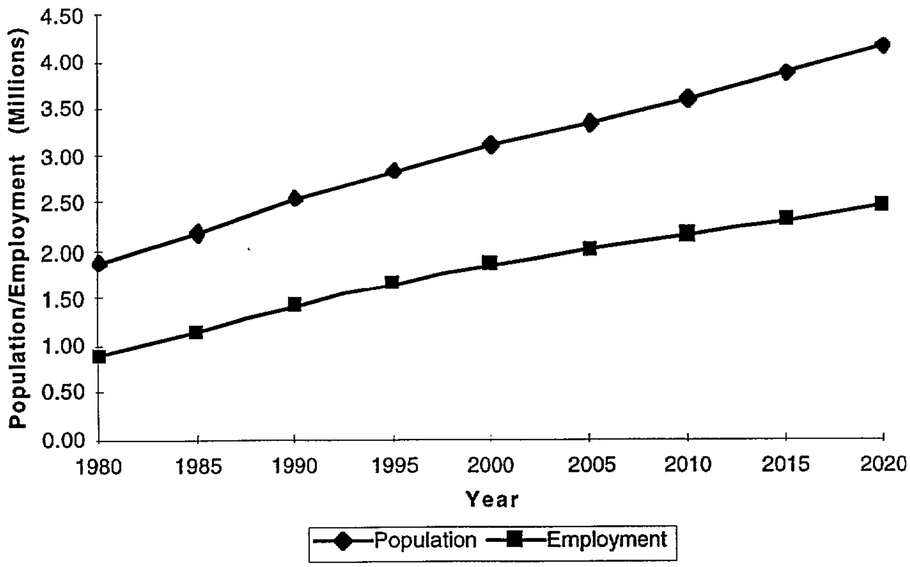
1.3.2 Regional Travel Demands

This projected population and employment growth is strongly indicative of a corresponding increase in the level of travel demand. The trend also suggests that overall regional travel patterns are becoming more dispersed.



Source: Vision 2020 Baseline Forecasts, Atlanta Regional Commission, June 1994

FIGURE 1-3. Regional Population and Employment Growth Projections (1990-2020): Directions of Growth



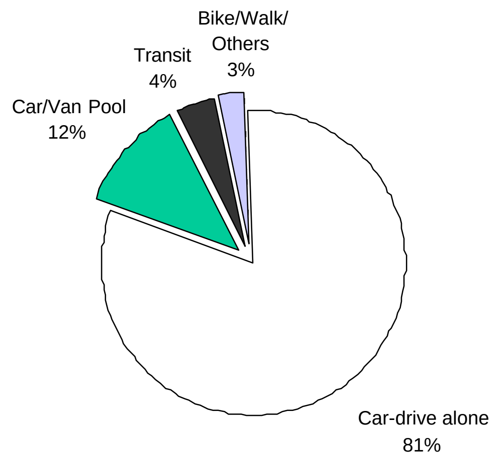
Source: Vision 2020: Baseline Forecasts, Atlanta Regional Commission, June 1994

FIGURE 1-4. Historical and Forecast Population and Employment in the Atlanta Region 1985-2020

The *Atlanta Regional Transportation Plan: 2010* [1] estimates that the proportion of daily work trips destined for the Atlanta Central Business District (CBD) will decline from 11 percent of all work trips in the region in 1980 to 7 percent in 2010. However, due to the growth rate and patterns in the region, total daily work trips to the Atlanta CBD are forecast to increase by 40 percent, from 168,000 trips in 1980 to 236,000 in 2010. Overall, the Atlanta region has and will continue to experience increasing demands on its transportation infrastructure.

Regional commute patterns, prior to the implementation of the express (HOV) lanes, indicate that four out of every five trips are made by car, with only one occupant (Figure 1-5). Reliance on cars is accentuated by the fact that average vehicle occupancy is 1.12 persons per vehicle. The national average vehicle occupancy for journey-to-work trips is 1.11 persons per vehicle, and 1.61 persons per vehicle for all trips. The Atlanta region's transit modal split is similar to national levels, but is somewhat less than that for cities with heavy rail systems.

[1] *Atlanta Regional Transportation Plan*: 2010, Atlanta Regional Commission, Atlanta GA, March 1990.



Source: Atlanta Express Lanes-market Strategies & Potential Utilization COMSIS Corporation, Aug 1996

FIGURE 1-5. Regional Commute Patterns Modal Split

1.4 INTELLIGENT TRANSPORTATION SYSTEM (ITS) DEPLOYMENTS OVERVIEW

This section describes the ITS systems installed in the Atlanta region, including ATMS/ATIS components, APTS components, and the FHWA DOTs.

1.4.1 ATMS/ATIS Components

The Olympic and Paralympic Games served as a focus for the deployment of ITS in Atlanta, including both highway and transit components. This section describes the Atlanta Regional ATMS and the Atlanta TIS, an ATIS project.

1.4.1.1 Atlanta Regional ATMS

The Atlanta Regional ATMS, linking eight agencies (each with its own control center) and including freeway, surface street, and transit operations, represents possibly the most complex and comprehensive ITS deployment yet attempted in the United States. The status of the eight control centers at the start of the games is summarized in Table l-l.

TABLE l-l. Status of ATMS Control Centers at Start of the Games

Center	Date Connected to ATMS Network	Functionality During the Games
City of Atlanta TCC	July 1, 1996	CCTV control, incident management software
Clayton County TCC	July 22, 1996	CCTV control
Cobb County TCC	Not connected	None
De Kalb County TCC	July 12, 1996	CCTV control, incident management software
Fulton County TCC	July 18, 1996	CCTV control
GDOT TMC	April 10, 1996	CCTV control, incident management software, CMS control, communications hub for GDOT operations including HEROs, and District 7, Atlanta TIS, Kiosks, and *DOT (cellular toll-free call-in service)
Gwinnett County TCC	July 24,1996	CCTV control
MARTA TIC	April 10, 1996 July 1, 1996	CCTV control, incident management software (excludes pre-existing TIC functionality) AVL (location and mapping only)

Source: BA&H interviews with control center staff:

Table l-l indicates that, apart from GDOT TMC and MARTA TIC, most centers became operational in the week before or after the start of the Olympic Games (July 19), and had access to CCTV control only. Each center had limited opportunity to become familiar with ATMS for the games.

Prior to the deployment of **ATMS,** MARTA TIC was responsible for scheduling and incident management functions. Every bus in the MARTA fleet is fitted with radio communications, which is used to support these functions. (Unlike the TMC, calls from the public are not handled by MARTA TIC, but by **MARTA's** Customer Service department.)

The regional ATMS system has 101.43 km of fiber-optic backbone, as shown in Figure l-6, plus 193.2 km of refreshed arterial communication backbone (primarily copper with a small percentage of fiber optic). These link the GDOT TMC to the MARTA TIC, and the TCCs in the city of Atlanta to the five surrounding counties of Clayton, Cobb, De Kalb, Fulton, and Gwinnett.

Video surveillance of the freeway network is provided by 89 closed-circuit television (CCTV) cameras (22 of which are slowscan), and 319 video imaging **cameras** installed on freeways and freeway ramps, as shown in Figure 1-7. A video imaging system was intended to provide traffic speed and volume information, but it was not fully operational and did not provide any real-time traffic data during the games.

Nonetheless, the video imaging cameras provided additional video surveillance capability. It is important to note that freeway video surveillance was intentionally

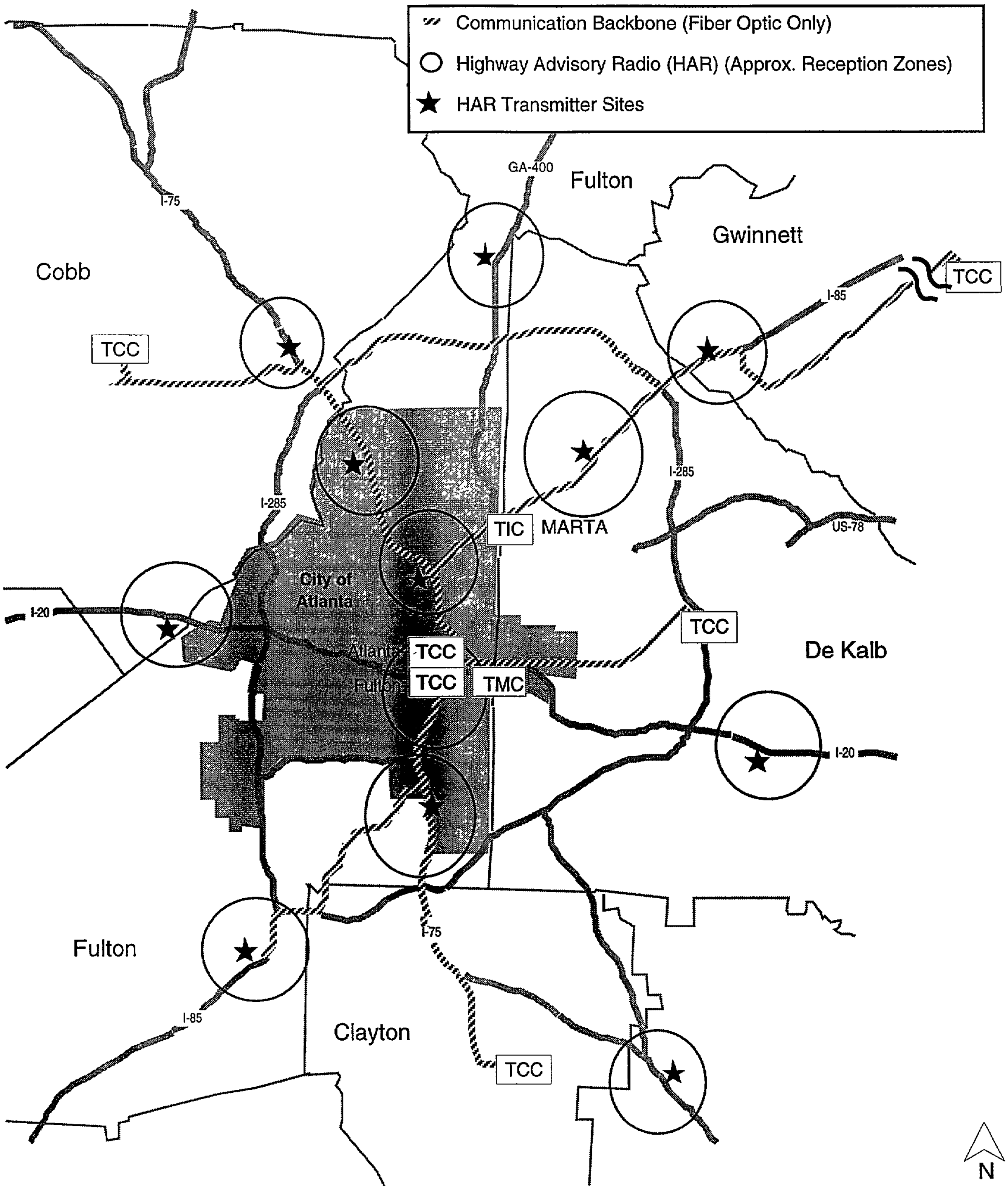


FIGURE 1-6. Communications Trunk, Control Centers, and Highway Advisory Radio

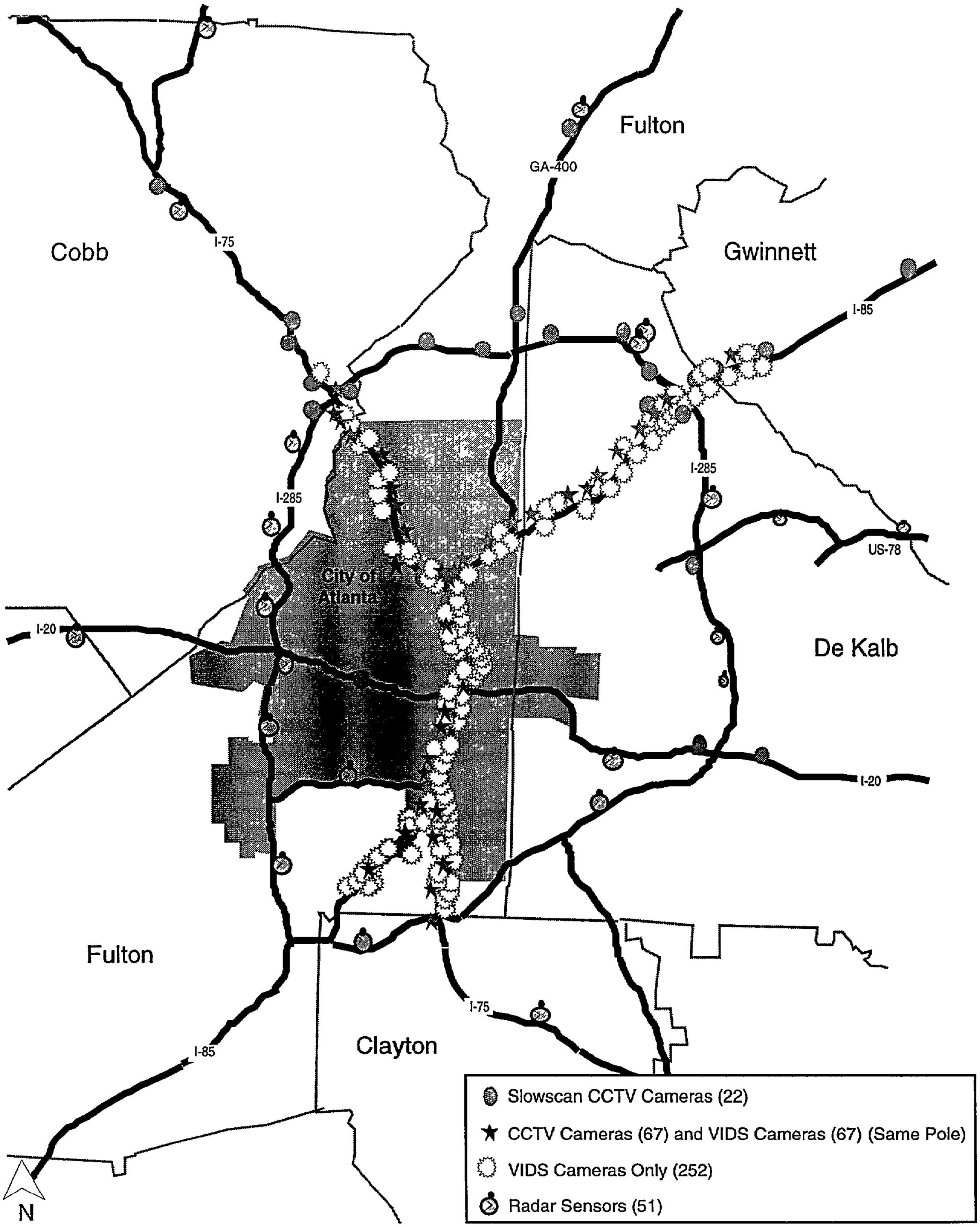


FIGURE 1-7. Video Surveillance

limited to I-75 and I-85, mostly within the I-285 perimeter. Only minimal freeway video surveillance coverage was planned on I-26 and the I-285 perimeter. During the Olympic and Paralympic Games, traffic speed data was collected from 51 radar sites on I-20 and the I-285 perimeter.

Twenty CCTV cameras were installed on city arterials at the start of the games, and an additional 37 CCTV cameras are planned. Two cameras were installed on De Kalb county arterials, and ten cameras on Gwinnett county arterials. During the Olympics, additional video surveillance was provided by the Atlanta Police Department (APD) blimp and a Georgia State Patrol (GSP) helicopter with a GDOT camera operator on board.

To provide traveler information to motorists, the system has 44 Changeable Message Signs (CMS), including 17 on the HOV lanes, as shown in Figure 1-8. The CMS are predominantly located on I-20, I-75, and I-85; GA-166 and GA-400 each have one CMS. There are no CMS on I-285. The system also includes 12 Highway Advisory Radio (HAR) cells, as shown in Figure 1-8. Attempts to use the HAR system were discontinued during the first week of the Olympic Games because the system was not able to notify the operators accurately that the flashing lights on the HAR signs were actually flashing. The system often indicated that the lights were flashing when CCTV camera images indicated they were not.

GDOT operates a call-in service for members of the public ("DOT). Call takers are able to give current travel information and receive details of stalled vehicles, accidents, and other information related to traffic flow.

1.4.1.2 Atlanta Traveler Information Showcase (TIS)

An important feature of the regional ATMS is the link to the Atlanta TIS components. The Atlanta TIS was funded by FHWA and FTA, in conjunction with GDOT and MARTA. The project showcased a range of technologies designed to provide traveler information.

Unlike the Atlanta regional ATMS, which mostly provides information and services to local agencies, the Atlanta TIS provides traveler information directly to the traveling public. Much of the data used by the Atlanta TIS is provided by the ATMS. These are augmented by spotters in cars and helicopters.

During the games, Atlanta TIS enabled real-time traffic information and multi-modal transportation information to be made available to the traveling public via:

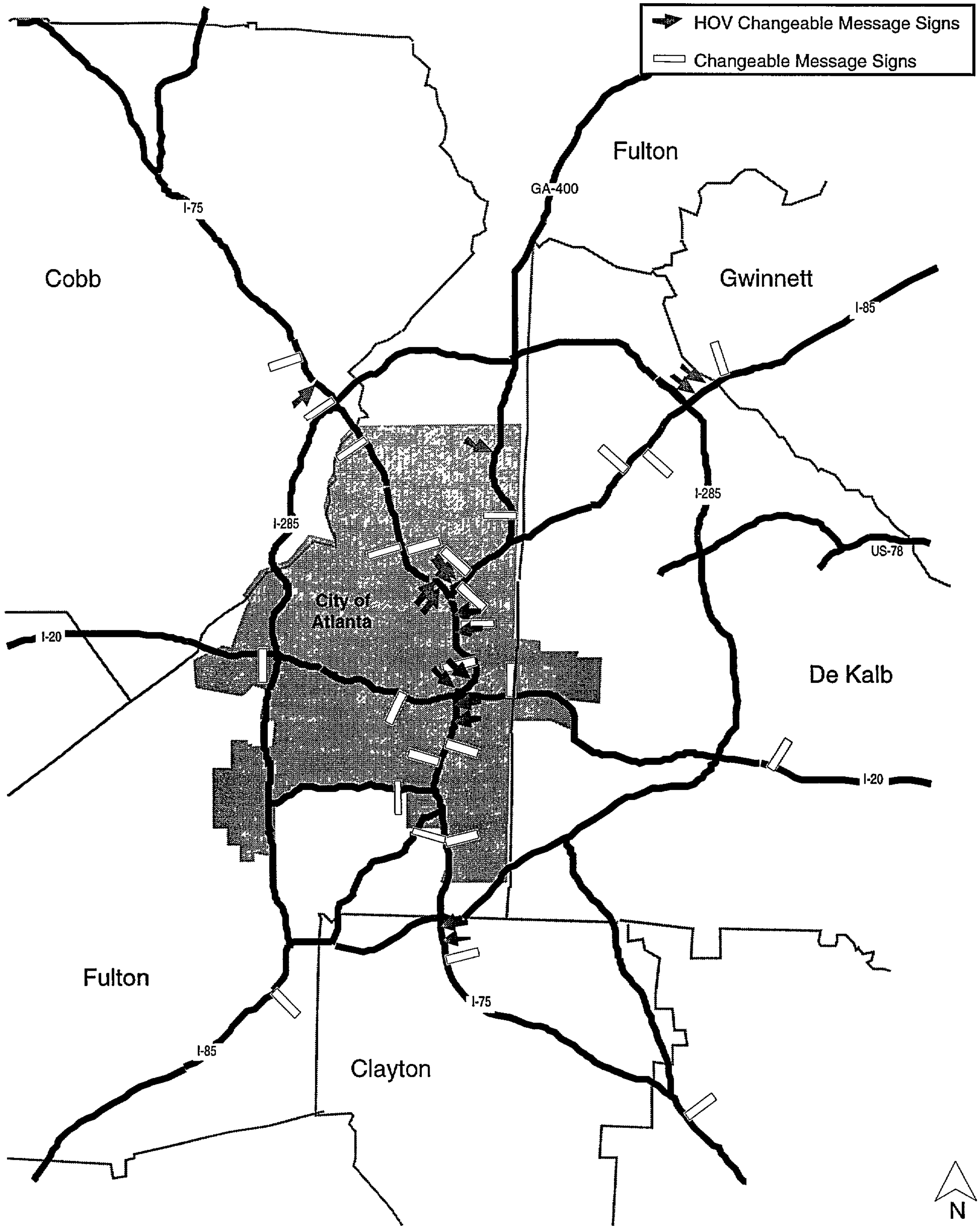


FIGURE 1-8. Changeable Message Signs

- **Internet:** The Internet site (www.georgia-traveler.com) home page provided information about Atlanta and the games. The home page had direct links to six other web pages or sites:
  - **Transportation page,** presented information about, or gateways to, real-time traffic, public transit, parking, wide-area travel, route planning, and freeway map.
  - Services **page,** presented information about, or gateways to, restaurants, lodging, movies, weather, bus routes and schedules, rail stations, and parking lots, and included a link to the Atlanta Convention and Visitors Bureau web site.
  - **Special Events' page,** contained links to several web sites including: Official Olympic Games, Olympic Arts Festival, Paralympic Games, AJC Olympic Report, and other Atlanta special events.
  - **Points of Interest page,** contained links to other web sites including Atlanta Area Attractions and other sites.
  - **ITS On-Line web site.**
  - **Atlanta Project (Showcase) page,** presented a description of the Atlanta TIS project.
- **Cable TV (Georgia Traveler Information Television),** available to 700,000 households in the Atlanta metropolitan area.
- **Interactive TV,** in selected hotel bedrooms (285 rooms in the Crowne Plaza Ravinia Hotel in Atlanta). Interactive TV users were able to interact with their in-room television using the remote control. A map-printing option was also available.
- **In-vehicle navigation systems (96 units):** In-vehicle navigation systems were installed in selected Hertz rental vehicles, and were made available to selected FHWA staff, Olympic staff, VIPs, and area employers.
- **Personal communications devices (222 units):** Personal communications devices, or hand-held computers, incorporated two-way paging technology.

The five TIS technologies made available information on current traffic conditions, route planning, transit, yellow pages, parking, Olympic and Paralympic Games, and wide-area travel. Atlanta TIS operated until March 1997, after which all systems were transferred to GDOT control.

The regional ATMS also provided transportation-related data to 100 kiosks, as part of the Atlanta Kiosk FOT (see Section 1.4.3). A Traffic Advisory Telephone Service (TATS) and computer Bulletin Board Service (BBS), both intended to provide real-time traffic information during the games, did not come online in time for the events.

1.4.2 APTS Components

The APTS project deployed during the Games was ITS MARTA '96, featuring the following components:

- **Geographic Information System (GIS):** A computer map of the regional road system, MARTA fixed-route transit service, 10,000 bus stop locations, and 2,500 major landmarks.
- **ATMS:** The MARTA portion of the system involves a fiber-optic connection between MARTA Headquarters Building and the GDOT TMC. This fiber-optic link allows MARTA to access other agencies' CCTV cameras.
- **Automatic Vehicle Location (AVL):** This is a global positioning system that uses satellite communications to locate buses and displays these locations on a computerized display map. MARTA equipped 250 buses in their regular fleet with AVL units. Route 5 was designated as the primary recipient of AVL-equipped buses because it operated from Lindbergh Station, close to MARTA headquarters. This facilitated system monitoring. The AVL system became operational and available to MARTA approximately three weeks before the games began.

  The AVL system has three primary functions. The first function is to locate **the exact position** of **buses** as they are operating in revenue or nonrevenue service. The AVL-equipped buses receive positioning data from orbiting satellites, permitting the location of each bus to be determined within an accuracy of 15.25 m. Augmenting the satellite reception is a differential **satellite-receiving** location at the MARTA TIC. AVL workstations at the MARTA TIC enable bus dispatchers to locate and view the positions of the buses as they travel along their routes. Bus dispatchers can use this **information** to evaluate route schedule adherence automatically and assist **bus operators** with directions or reroutes due to traffic congestion or road emergencies. (The route schedule adherence component was not operational during the games.)

  The second function of AVL is to communicate mechanical problems or failures detected through equipment alarms that are automatically activated by sensors on the bus. The AVL workstations provide a checklist of typical mechanical, failures, such as low oil and engine overheat, which are automatically detected by the AVL system. This allows the bus dispatchers to notify bus operators of mechanical failures they may not notice while operating the bus.

  The third function of AVL is to assist a bus operator during times of emergency. On each AVL-equipped bus is a covert microphone that, if activated, allows the dispatchers to listen in on any activities on the bus. The ability to listen in on these activities, combined with the real-time positioning information, can assist the dispatcher in swiftly deploying emergency response personnel or other mitigating actions, if needed.

- **ATIS/Itinerary Planning:** A computer system that merges the GIS system with the bus and rail schedules to develop individualized trip itineraries for customer queries. This component is more commonly known as the Passenger Routing and Information System (PARIS).

  Customer information telephones were also located in rail stations to connect customers with MARTA information operators who had access to the automated trip itinerary planning capability of the ATIS. This information was available in English, French, Spanish, German, and Japanese.

- **In-Vehicle Announcements:** This component uses the AVL system in the equipped buses to provide audio and visual announcements of bus stops along their assigned routes. This component was installed on 100 of the 250 AVL-equipped buses, but was not operational because the real-time component of AVL was not operational during the games.

- **Automated Passenger Counters (APC):** This is an additional component of the AVL system. Using sophisticated beam technology, APC is designed to eliminate **human** error when counting passengers. The APC was necessary on AVL-equipped buses because the interface between the two systems provided the mechanism **for** reporting current passenger count information to the MARTA TIC by **radio** communications. The APC system was planned to be **installed** in 15 of the **100 buses** with the in-vehicle announcement component. While the system was installed on three of the planned 15 AVL-equipped vehicles, the system was **not** operational during the Olympic and Paralympic Games.

  This technology offers significant benefits to the existing system that MARTA and other **transit** agencies nationwide currently use to obtain fixed-route operating data. The FTA requires that transit agencies receiving urbanized area formula funding report transit passenger data based on procedures outlined in Section 5335, Uniform System of Accounts and Record Reporting System. **These procedures** suggest an approach for the collection of annual passenger trips and annual passenger miles through revenue based sampling procedures. A specific number of bus trips are randomly selected each week and surveys are conducted by in-house or hired staff to count the number of passengers boarding and alighting the bus for selected trips. The sampling of on-off counts, farebox revenue, and distances between stops provides the survey information needed **to** estimate annual passenger trips and passenger miles for the whole system.

  The APC system can assist the data collection process by actually counting the passengers that board and alight from the bus for the selected trips, thus eliminating the need for and cost of surveyors to perform these counts. APC-equipped buses can easily be assigned to the randomly selected routes that are designated for passenger counts each week.

The optimum scenario for transit surveillance would be to equip the entire **fleet** with APC. All passengers boarding and alighting from buses throughout the fixed-route network could be counted. This would eliminate the need to sample routes and would provide the transit agency with a complete sample of all passengers using the fixed-route network.

The primary purpose of the APC is to assist MARTA planners and schedulers with the analysis of patronage data from bus routes. The APC system records the number of passengers boarding and alighting from a bus at each bus stop location and sends the information each hour to the MARTA Scheduling Department. This information then allows MARTA planners and schedulers to use stop-by-stop passenger counts to determine if routes and route segments are being used effectively. Using this information, adjustments and refinements can be made to specific routes on a daily basis.

- **Passenger Information Devices:** Two types of passenger information devices (PID) were deployed: rail station monitors, and bus stop light-emitting diode (LED) signs. Nine 685.8-mm monitors were located in the higher volume MARTA Rail stations with bus transfer facilities. The monitors displayed the scheduled departure times and the real-time status of connecting bus services, but were not operational during the games, except occasionally to display schedule (not real-time) information.

  Six LED signs were located at bus stops and bus shelters similarly to display **the scheduled departure** times and the real-time status of buses operating **along the** route. The LED signs were only located at bus stops serving one or two routes. They were not designed to provide information for more than two routes on each sign, and they were not operational during the games.

- **Smartcard Fare Implementation:** This was a pilot test of smartcard technology, sponsored by VISA and Nations Bank, First Union Bank, and Wachovia Bank, to examine the feasibility of using multiuse smartcards for all types of retail applications, including transit. Stored-value card reading devices were located at fare gates at selected MARTA Rail stations. Smartcards could be purchased in amounts of $5, $10, and $20 and could be used to pay fares at MARTA Rail stations. Each time the smartcard was used, the amount of the purchase was deducted from the remaining value of the card and could be viewed on a small screen on the terminal used to read the card.

  After the effects of the pilot test on transit fare collection have been evaluated by MARTA, a decision will be made on the future of the program. If the program is continued, it will be integrated into the fare collection system now in place in the MARTA Bus fleet.

- **MARTA Rail Train Control System:** MARTA recently replaced its train control system that had been in place since the late 1970s. The train control system was fully implemented, tested, and operational prior to the games. It was necessary to have this new system in place to support the opening of the

North Line Extension. The previous train control system would not have been able to accommodate this expansion of the rail network.

The entire rail system is now centrally controlled. Staff view rail system conditions on video monitors and large mosaic display boards in the central operating room, monitoring and controlling the progress of trams along the North / South and East / West Lines. The train control system employs proven concepts of automatic train control (ATC). Trams are dispatched from the ends of the lines by the MARTA Rail central control facility at Avondale. Trains are stopped automatically at each station and the operator opens the doors, closes the doors, and then pushes a button to accelerate the train automatically.

The train control system has a playback feature that is similar to a video cassette recorder and provides visual and audio playback of incidents occurring along the rail system. The central operating room is configured with two separate computer systems:

- The Train Control Computer System monitors each tram along the guideway and provides real-time information to the staff controllers regarding tram location and operating status, e.g., vehicle speed, doors opened / closed, etc. The system is responsible for ensuring the safe flow of trains through each of the stations, while maintaining the required distance from other trams along the same route. In addition, the system can automatically shut **down** the operation of a tram if it is determined to **be** at an unsafe distance from other trains.
- The Supervisory **and Control** Computer System monitors electrical power to the guideway and trams, and provides the controllers with several safety functions to identify power surges, fires, or track malfunctions.

1.4.3 Field Operational Tests (FOTs)

Two FOTs were initiated for the games: the Atlanta kiosk and ADAS.

- **Atlanta Kiosk FOT:** Starting in the spring of 1996, GDOT in partnership with the GeorgiaNet Authority, installed 100 electronic touchscreen traveler information kiosks in the Atlanta region and around the state. The Americans with Disabilities Act (ADA) accessible kiosks provided relevant traveler information in multiple languages allowing travelers easier mobility throughout the Atlanta region.

  The system serves as an information link to the traveler, providing:
  - Real-time traffic and incident data from the ATMS.
  - Point-to-point vehicle route planning.
  - Transit schedule and route itinerary planning.
  - Tourism information.

- Current weather information.
- Airline schedule information.
- Rideshare information.
- Special Event information, such as Olympic route and parking information.

Kiosks are located at transit stations, airports, hotels, public and private office buildings, visitor centers, rest areas, hospitals, and shopping centers in the Atlanta metropolitan area and around Georgia. They target a wide and varied audience, including visitors, daily commuters, transit system users, pedestrians, fleet operators, and others. The design includes a kiosk system that communicates with the GDOT TMC to obtain up-to-date traffic information. Other information providers include: MARTA, the Weather Channel, airlines, and the Georgia Department of Industry, Trade and Tourism.

GDOT teamed with the GeorgiaNet Authority for this project. Now that the games are over, GeorgiaNet owns and maintains the kiosks. GeorgiaNet was formed in 1990 to market centrally and sell, on-line or in volume, authorized public state information. With revenue generated through sponsorships, GeorgiaNet plans to maintain, and possibly expand, the kiosk project in the future, without public funds.

- **Atlanta Driver Advisory System (ADAS) FOT:** ADAS tested two communications methods chosen by the FHWA for potential use nationwide. ADAS **delivered** real-time transportation information from the ATMS to enroute vehicles. A public/private partnership was formed between FHWA and Scientific Atlanta for this operational test project. Other members of the test team included: GDOT, Federal Express, Georgia Technical Research Institute, TRW, and Oak Ridge National Laboratory.

  The two communications methods were an FM subcarrier traffic information channel (STIC) and a 220 MHz digital radio network (DRN).

  - **FM Subcarrier Traffic Information Channel:** The STIC was developed to meet the ITS requirements for a wide-area broadcast system. It was designed to perform well in a high-multipath environment, to cover a wide area with a small investment in infrastructure, and to have the data capacity needed to meet the requirements for traffic information for a large city.

    In Atlanta, the STIC was used to provide the test vehicles in a 48.3-km radius with information on traffic and roadway conditions. This information was conveyed via the FM subcarrier-supported graphic displays, which depicted the speed data in a map format, using icons to indicate levels of congestion and incidents. The transportation data were transmitted via phone line from the ADAS workstation located at the

TMC to an FM broadcast station, where it was broadcast with the regular FM signal.

- **Digital Radio Network (DRN):** FHWA has been granted use, on an experimental basis, of five 220-MHz channel pairs for 15 years. These channels are available nationwide and are suitable for many ITS applications. As part of the DRN, there were seven low-power, short-range local area transceivers (LATs) placed near exit ramps. These LATs were capable of transmitting and receiving data from both the test fleet (170 vehicles, divided evenly between GDOT and Federal Express) and the ATMS.

ADAS was not operational during the games, but was evaluated during November and December 1996.

1.5 OTHER TRANSPORTATION INFRASTRUCTURE

Two major infrastructure components were also deployed for the games. These were: the express (HOV) lanes, and the MARTA North Line Extension.

1.5.1 HOV Lanes

A network of HOV lanes was deployed in Atlanta to encourage carpooling and promote **transit use. One hundred and** twenty-six kilometers of HOV lanes were implemented on freeways within the I-285 perimeter, covering all of I-75, most of I-85, and **I-20 east of the I-75/1-85 connector (Figure l-9). The I-75 and I-85 HOV lanes** opened **in June 1996 and operate 24 hours** per day. The I-20 HOV lanes opened in late 1994. They operate **westbound (inbound) during** the morning commute period and eastbound (outbound) during the afternoon commute period, Monday through Friday. The HOV lanes **on** I-20 are **open to all** traffic at all other times.

Only six freeway interchanges **have** dedicated HOV lane entry/exit ramps. All but one of these are limited by direction, i.e., the three interchanges north of the CBD have northbound on-ramps and southbound off-ramps, with the reverse situation for the two interchanges south of the CBD. (The fully directional interchange is on I-75 at Aviation Boulevard, which is near the airport to the soul:h of the city.)

The HOV lanes are available to vehicles with two or more occupants and to motorcycles. Regularly scheduled MARTA Bus services rarely use the HOV lanes because buses do not generally use **freeways.** Buses used for Olympic and Paralympic Games operations made extensive use of freeways and were therefore expected to use the HOV lanes.

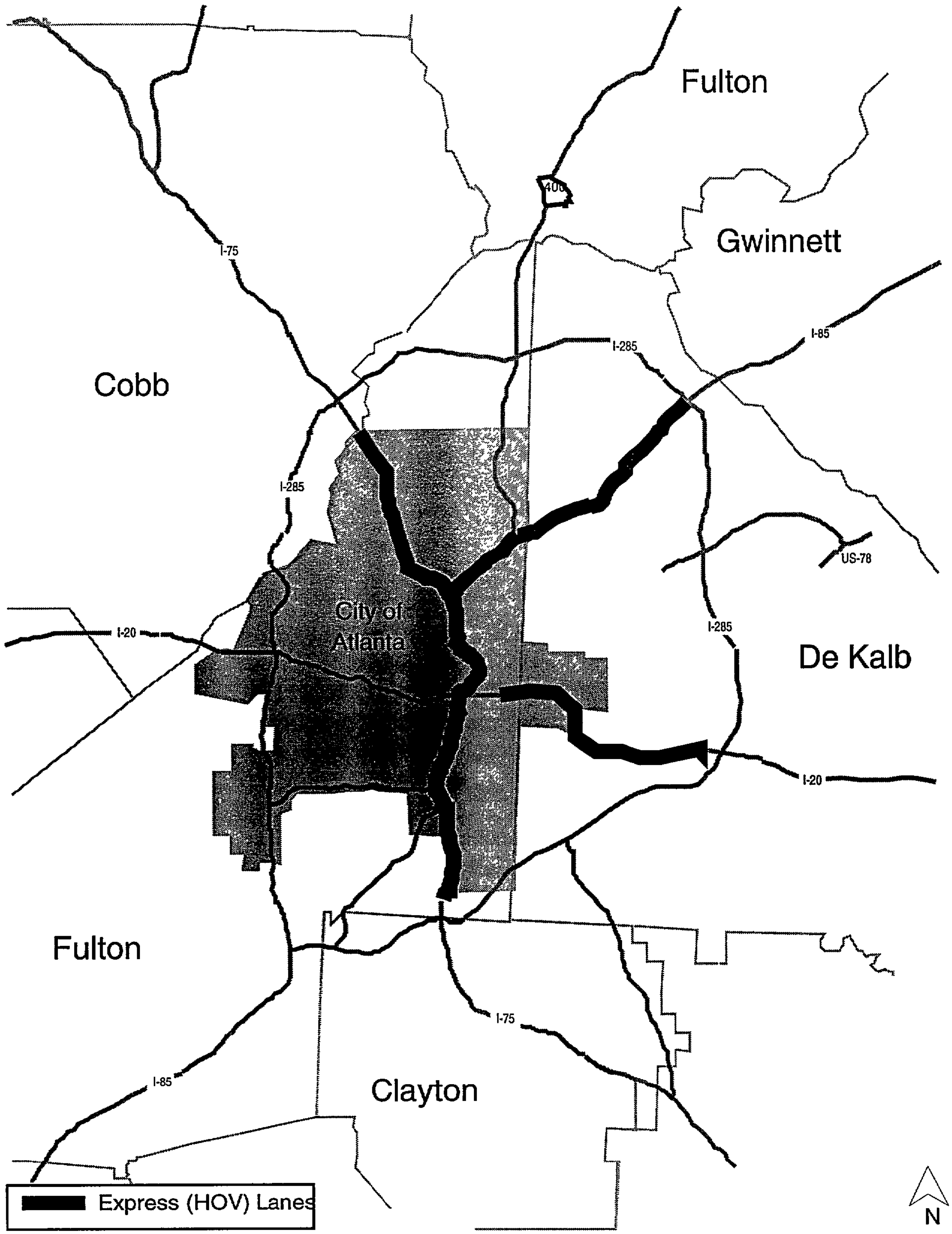


FIGURE 1-9. HOV Lane System

1.5.2 MARTA North Line Extension

MARTA expanded its rail network to 74.06 km and 36 stations (the extension included 12.719 km and three new stations) with service into the rapidly growing northern suburbs of metropolitan Atlanta. This new segment, illustrated in Figure l-10, is called the North Line Extension and begins approximately 1.288 km north of Lindbergh Station. At this point the guideway branches off from the Northeast Line and travels north, along the median of the GA-400 toll road to the I-285 Perimeter. The guideway then bears to the northeast for approximately 1.61 km to its final destination just past the I-285 Perimeter. The North Line Extension is part of MARTA's heavy-rail capital investment program, which includes further expansion of the North Line into the North Springs area.

The North Line Extension began operation on June 8, 1996, providing service to three new stations in the northern suburbs. Service begins at Lindbergh Station, from which northbound trains travel to either the North Line or the Northeast Line. Trains stopping at Lindbergh Station are signed with their designated service to the North Line or Northeast Line. Service on the North Line Extension runs every 8 min between Lindbergh Station and Dunwoody Station, the final destination point on the North Line.

From Lindbergh Station, the North Line service travels 3.542 km to Buckhead Station located on Peachtree Road, 15 min from Five Points Station. Five Points Station **is** the interchange station between the North / South and East / West Lines in downtown Atlanta. Buckhead Station serves as a passenger drop-off area only, because it does not have a Park & Ride facility, due to geographical constraints. From Buckhead Station, the North Line continues on for approximately 7.567 km to Medical Center Station, which is located on Peachtree-Dunwoody Road. This station is located near three medical facilities: Northside, Scottish Rite, and St. Joseph's Hospitals. Medical Center Station has approximately 350 parking spaces and is 22 min from Five Points Station. From Medical Center Station, the North Line continues 1.61 km to its final destination point at Dunwoody Station, located on Hammond Drive near the Perimeter Mall. This station has approximately 572 parking spaces and is 24 min from Five Points Station.

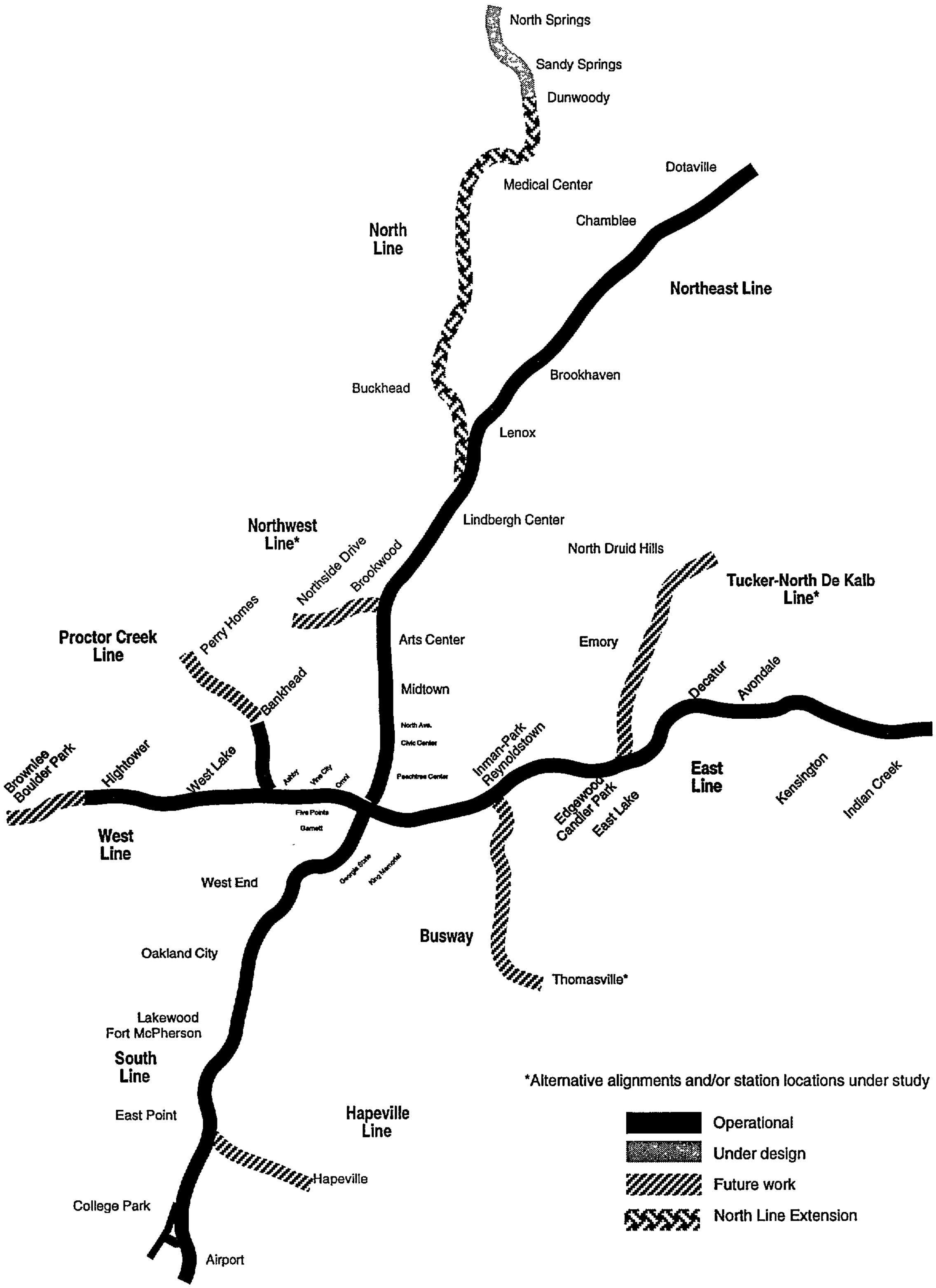


FIGURE 1-10. MARTA Rail System and North Line Extension

2.0 THE OLYMPIC AND PARALYMPIC GAMES

This section contains comparative information on the size of the Olympic and Paralympic Games, and describes services, organizational structures, and communications plans established to meet their transportation requirements. The section also presents a description of agency transportation roles during the games, travel demand forecasts and management, and a summary of travel demand statistics for the Olympic Games. A brief description of the daily transportation status reports provided by BA&H to the USDOT Information Resource Center (IRC) is also included in this section.

2.1 DIMENSIONS

The games were held in Atlanta during the following periods:

- Olympic Games: July 19 to August 4.
- Paralympic Games: August 15 to August 25.

The Olympic and Paralympic Games were the world's two largest sporting events in 1996, in terms of athlete and spectator attendance. The Atlanta Olympic Games were the largest Olympic Games ever. A comparison of ticket sales (which excludes the Olympic Family, comprising athletes, officials, sponsors, and media representatives) indicated that the Atlanta Olympic Games attracted nearly as many paying spectators as the Los Angeles and Seoul Olympic Games combined (Table 2-l). Average daily ticket sales were greater than 500,000, excluding tickets provided to the Olympic Family. Table 2-l also shows that this total exceeds corresponding daily attendance at other major sporting, political, and exhibition events that have been staged in Atlanta, by a factor of at least five. This is all the more significant, given the 17-day duration of the Olympic Games.

TABLE 2-l. Athlete and Spectator Attendance at Large Events

Event	Athletes	Ticket Sales	Duration (days)
Atlanta Olympic Games	16,600 [1] 37,000 [2]	8,600,000 [5]	17
Atlanta Paralympic Games	5,650 [1]	512,300 [5]	11
1984 Los Angeles Olympic Games	Not known	5,979,000 [5]	16
1988 Seoul Olympic Games	13,300 [1] 36.000 [2]	2,940,000 [4] 3.014.000 [5]	15
1992 Barcelona Olympic Games	15,620 [1] 39,460 [2]	3,092,000 [5]	20
2000 Sydney Olympic Games (projected)	Not known	5,000,000*	Not known
Major **Sporting, Political, and Exhibition Events held in Atlanta**			
1994 Superbowl	100 [1,*]	85,000 *	**1**
1995 World Series	100 [1,*]	280,000 *	**4**
1988 Democratic National Convention	N/A	160,000 *	**4**
1995 Comdex	N/A	340,000 *	**5**
1995 SuperShow	N/A	500,000	**5**

* Estimate
1 Athletes and officials
2 Olympic family
3 Athlete only
4 Total visitors (foreign and domestic)
5 Tickets sold

Sources: Atlanta Regional Commission
Atlanta Committee for the Olympic Games
Atlanta Paralympic Organizing Committee
Official Report: Games of the XXIIth Olympiad, Los Angeles 1984
Official Report: Games of the XXIVth Olympiad, Seoul 1988
Report to the Executive Board of the IOC, November 1992

Perhaps the most significant factor about the arrangements for the Atlanta Olympic Games was the location of the sporting venues. Unlike the Los Angeles Olympic Games, all the major sporting venues were located within the Olympic Ring (Figure 2-l). The Olympic Ring, which encircled an area in a 2.415-km radius of downtown Atlanta, contained not only sporting venues, but also the Olympic Village and Centennial Olympic Park. While this concentration of Olympic Games-related activities in downtown Atlanta contributed to the ambiance of the games, it also brought with it significant transportation challenges and concerns. One such challenge was the movement of spectators into and out of the Olympic Ring. The games' organizers, the Atlanta Committee for the Olympic Games (ACOG), decided

However, the Paralympic Games shuttle bus loading and drop-off area was located closer to the Olympic Stadium. The shuttle schedule was as follows:

- Opening Ceremonies: August 15, 1996, from 6:00 p.m. until venue cleared.
- Athletic Events: August 17 through August 25, 1996, from 7:00 a.m. until 11:00 p.m.
- Closing Ceremonies: August 25, 1996, from 6:00 p.m. until venue cleared.

Spectators were permitted to ride the shuttle buses without paying a fare.

MARTA supplemented the shuttle bus fleet with L-vans, which are lift-equipped vehicles used by MARTA for its paratransit service, for both the opening and closing ceremonies. To accommodate the late completion of the opening and closing ceremonies, MARTA extended its rail service on August 15 and 25. In addition, MARTA continued to provide its shuttle from the Atlanta-Fulton County Stadium to the Five Points Station on Braves' game days, and spectators for the Paralympic Games were permitted to use this shuttle free of charge, as well.

MARTA also identified rail stations that would be heavily used by disabled persons during the Paralympic Games. Additional staffing was provided to ensure adequate availability of MARTA volunteers and maintenance personnel for elevators, escalators, and faregate service and patron assistance. The following stations were identified as requiring special attention during the Paralympic Games:

- Airport
- Avondale
- Georgia State
- Midtown
- Peachtree Center
- Ashby
- Five Points
- Lenox
- Omni
- West End

2.3.1.6 APOC Shuttles

APOC also operated special spectator shuttles, utilizing the loaned buses remaining from the OTS fleet and operated by Department of Defense drivers. Three spectator shuttles were operated at no cost to riders, serving the following stations and locations:

- Midtown to Aquatic Center.
- Ashby to Clark Atlanta University Center.
- Hugh Howell Park & Ride Lot to Stone Mountain Venues.

that rather than risk traffic gridlock, no parking spaces would be made available at venues within the Olympic Ring. This effectively imposed the obligation on ACOG to provide a transit option for spectators, as well as for the Olympic Family.

This combination of the size of the Olympic Games and the concentration of games-related activities in downtown Atlanta set the context for our assessment of the Olympic Games transportation experience.

By comparison to the Olympic Games, the Paralympic Games achieved a much lower level of ticket sales. At an average of less than 50,000 tickets sold per day, the intensity of the transportation challenges facing Atlanta was much less than for the Olympic Games, and less than other major sporting, political, and exhibition events previously staged in Atlanta.

2.2 THE OLYMPIC GAMES

The transportation requirements for the Olympic Games demanded an extraordinary degree of interagency coordination. Planning for the transportation system had to take into account a number of nontransportation issues, e.g., security, and athlete training schedules, that had a transportation impact.

2.2.1 Olympic Transportation System Description

ACOG was responsible for providing transportation to the Olympic Family and the spectators attending the Olympic Games. ACOG provided overall coordination and management of the three components of the Olympic Transportation System (OTS):

- The Olympic Family Fleet System (OFFS).
- The Olympic Family Transportation System (OFTS).
- The Olympic Spectator Transportation System (OSTS).

The OTS bus fleet was composed of loaned buses from transit agencies nationwide and from private operators. A pool of approximately 4,000 drivers was assembled to operate the OTS buses. MARTA both operated and maintained the OSTS bus fleet, and also maintained the OFTS bus fleet. Operation and maintenance of the OFFS remained the responsibility of ACOG.

2.2.1.1 Olympic Family Fleet System

The OFFS, operated and managed by ACOG, consisted of automobiles and other light vehicles made available to the Olympic Family (e.g., International Olympic

Committee, ACOG) and guests (VIPs). This service was specialized and was available at any time, depending on the requester's level of accreditation.

2.2.1.2 The Olympic Family Transportation System

The OFTS was operated by a private transportation management company under contract to ACOG. OFTS provided transportation for the athletes (competing and spectating), media, sponsors, technical officials, and various staff and volunteers. The OFTS was composed of individual fleet operations that were focused on each component of the Olympic Family. A separate and distinct service was organized for each component:

- An athlete system, with buses operated by Department of Defense drivers as a security precaution.
- A bus and van system for the games officials.
- A separate bus system for the media.
- Buses and vans for the sponsors.

The OFTS fleet consisted of approximately 800 transit buses and over 200 vans leased by **ACOG** for each operation specifically. The transit buses used by ACOG in the operation of the OFTS were maintained by MARTA at temporary ACOG facilities, since these buses were part of the national transit fleet supported under an FTA grant for the Olympic Games.

The OFFS and OFTS were **not** directly assessed as part of the Event Study.

2.2.1.3 The Olympic Spectator Transportation System

The OSTS consisted of approximately 975 transit buses and was organized to plan, design, and operate the transit bus services for the spectators and volunteers. These services were organized and operated by MARTA under contract to ACOG, and both parties participated in the training of operational staff. OSTS service consisted of the following components:

- Olympic spectator bus services were operated directly to and from venue sites from separate parking areas and indirectly to and from venue sites via shuttle bus services to the MARTA Rail network.
- Regularly scheduled MARTA Bus and Rail transportation services were expanded to serve several travel market segments to **the** maximum extent possible within equipment and facility capacity limitations. These market segments were:
  - Spectator, employee, and volunteer access to venue sites.

- Olympic Games-related activities areas such as the Centennial Olympic Park and the Cultural Olympiad.
- Related travel demand increases throughout the Atlanta region due to the significantly higher visitor travel and the modified local residential travel, both directly and indirectly due to the Olympic Games.

- 80,000 spaces in 45 Park & Ride lots and three Park & Walk lots, all operated by ACOG.
- MARTA Rail services, which operated 24 h each day, much of the time with planned headways of 4-8 min on both lines (North / South and East / West).
- MARTA shuttle bus services from six MARTA Rail stations to seven venues (in addition to MARTA scheduled bus services using its regular fixed-route fleet of 785 buses).

These spectator transportation services were designed to accommodate spectator, employee, volunteer, and visitor travel to the venue and Olympic Games-related activity sites. The expanded MARTA transportation services were also designed to accommodate the incremental localized travel demand from the visitors and residents for non-Olympic trip purposes to any other regional destinations.

2.2.2 Organizational Structure

The organizational structure for transportation management during the Olympic Games is illustrated in Figure 2-2. This structure included all management and operational areas required to operate the OTS. The key departments included:

- **Transportation Management Center** (TMC): The TMC was a major information / communications hub for transportation operations during the Olympic Games, especially (but not exclusively) for highway operations. The TMC was operated by GDOT and managed freeway operations. GDOT coordinated its freeway management operations by colocating incident management, HERO operations, and District 7 maintenance operations dispatch at the TMC. In addition to GDOT, many agencies were represented within the TMC or on its campus: FHWA, ACOG, Georgia State Patrol (GSP), Georgia Emergency Management Agency (GEMA), and the State Olympics Law Enforcement Command (SOLEC).

  Also located in the TMC were the Command Table, for immediate decision-making by representatives from several agencies, including: FHWA, GDOT, GSP, and ACOG, and the Resource Table, which managed human and physical resources (FHWA and GDOT). Based on a model used by GDOT and GEMA for previous special events, such as severe weather, both the Command Table and Resource Table coordinated the response to incidents that required resources or management beyond the scope of individual agencies. There were no incidents that involved massive deployments

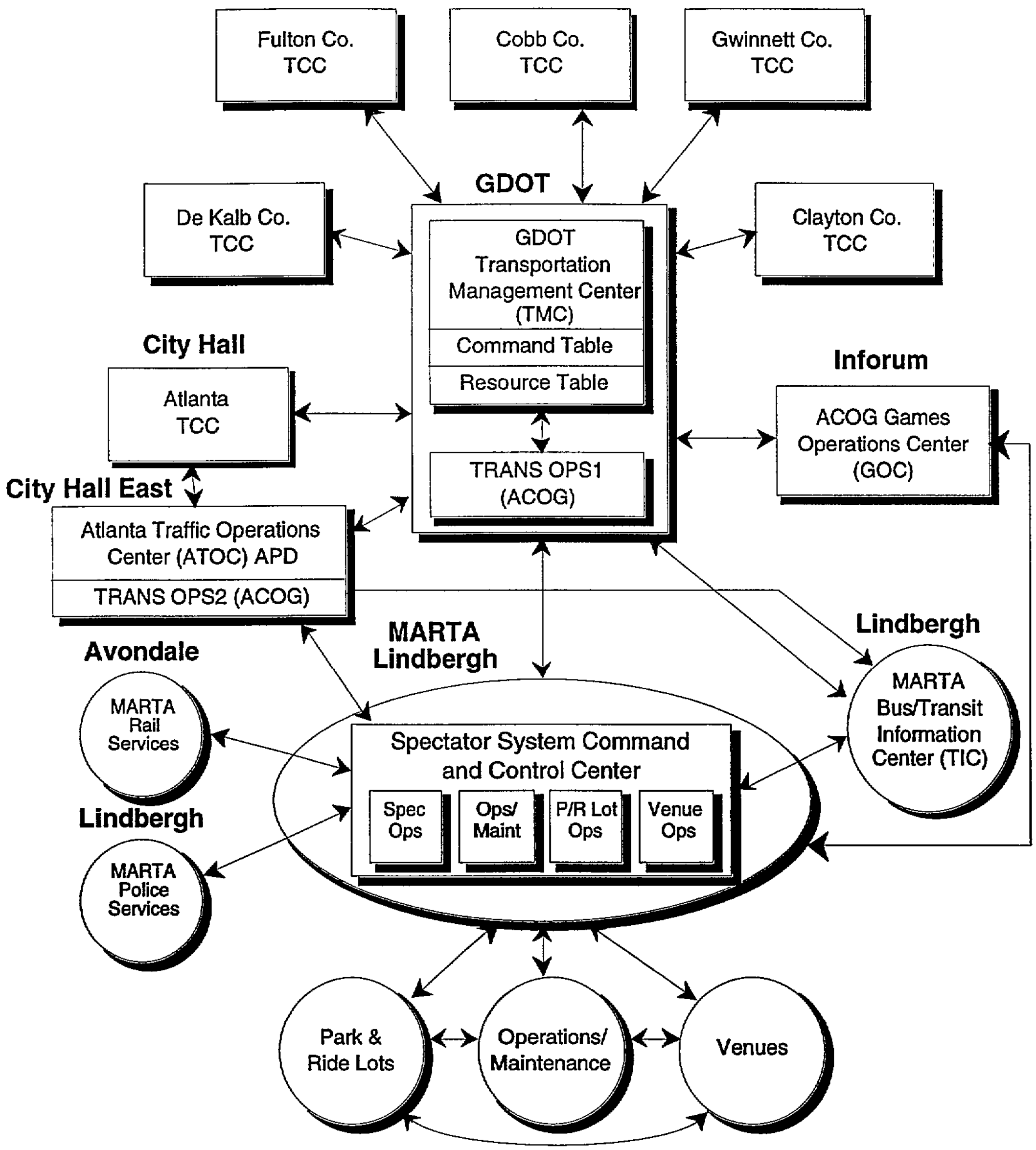


FIGURE 2-2. Organizational Structure for Transportation Management During the Olympic Games

during the events period and, hence, the Command Table was only convened as necessary. Typically, this was during the early part of the morning as each day's operations commenced. The Resource Table was functional 24 h per day. The TMC also provided information to the public, interfaced with the Atlanta TIS, and served as a major point of contact for the media.

- **Transportation Control Centers:** TCCs were operated by the city of Atlanta, and the counties of Clayton, Cobb, De Kalb, Fulton, and Gwinnett, and were responsible for surface street monitoring and incident response. TCCs did not operate with their full planned functionality, because they (and the MARTA

TIC) were unable to access the TMC database to the extent that had been originally envisioned.

- **Games Operations Center GOC:** This facility was operated by ACOG and was responsible for coordinating all aspects of the Olympic Games, including information, event management, spectator tickets, and transportation.
- **Atlanta Traffic Operations Center** (**ATOC**): This facility handled Highway and street traffic control and security and was implemented and managed by the Atlanta Police Department. GDOT, ACOG, and MARTA staff were also based in ATOC, to facilitate communications with their respective organizations.
- **Spectator System Command and Control Center**: This communications center and radio room was developed at MARTA headquarters. It served as the hub for all OSTS operational departments, including MARTA Rail, MARTA Bus, MARTA Police, Park & Ride Lots, Operations / Maintenance, and Venues. In addition, spectator communications housed key managers for each of these departmental areas, who could be contacted through direct telephone communication.
- **MARTA Transit Information Center:** This was the control center for the operation of MARTA fixed-route bus services. This center included monitoring and incident response of fixed-route operations through the use of radio communications directly with vehicle operators, as well as the use of the recently implemented AVL system.
- **MARTA Rail:** This control center for the MARTA heavy rail service was located near Avondale Station on the East **Line.** This center provided a central communications point for rail operations, including the ATC system. The movement and operational safety of the entire rail operation were directed from this facility.
- **MARTA Police:** This department was located at Lindbergh headquarters and was responsible for the safety and security of the entire MARTA transit operation. During the event period, MARTA police also responded to incidents involving station overcrowding, bomb scares, and traffic movements at rail stations and venues, when required.
- **MARTA and ACOG Park & Ride Lots:** This unit was responsible for the operations of the Park & Ride lots developed to feed the OSTS bus services that transported passengers directly to the venues in the downtown area. Park & Ride staff monitored the Park & Ride lots and assisted passengers with boarding and alighting from OSTS buses.
- **MARTA Operations/Maintenance:** This department included representatives of the five operating and maintenance terminals used to support the OSTS buses. These facilities were positioned within the OSTS service area and were responsible for ensuring the operation and maintenance of the OSTS buses. The terminals were divided into two functional units: Terminal Operations, and Terminal Maintenance.

Terminal Operations operated the spectator bus services connecting the venue sites with suburban Park & Ride lots, offsite venue parking locations, and the rail stations with overflow parking facilities. Terminal Operations also supervised the operation of the connecting OSTS bus services. Terminal Maintenance serviced and maintained the loaned spectator and Olympic Family transit bus fleets.

- MARTA Venues: This unit supervised the boarding and alighting bus operational areas at each venue site and coordinated with the operation of the connecting bus services.

The lines of communication for each of these agencies and departments were dependent upon their roles within the OTS. The TMC was located essentially at the center of the organizational structure, with report lines from ATOC, the GOC, MARTA Bus, and Spectator Communications. The TMC provided information to the TCCs and the TIC regarding highway traffic conditions and incidents. Spectator Communications served as the central communications center for the OSTS, and had a direct telephone line to the TMC to report operational issues or incidents. The MARTA TIC also had a direct line of communication to the TMC to report or receive information regarding transit and traffic incidents.

2.2.3 Communications Plan

The following discussion presents an overview of the planned flow of communications for the OSTS. The OSTS communications system encompassed seven key organizational departments that were responsible for operating spectator transportation services, as illustrated in Figure 2-3. The Spectator System Command and Control Center acted as the administrative central control facility for each of the other six operational departments:

- Venue Management and Staging.
- Park & Ride Lot Management and Staging.
- Operating Terminal Management.
- MARTA Bus.
- MARTA Rail.
- MARTA Police.

Communications among these departments was achieved via hand-held radios and telephone connections (where permitted by facility characteristics). The following discussion provides a detailed summary of the responsibilities of each of these departments and their key staff.

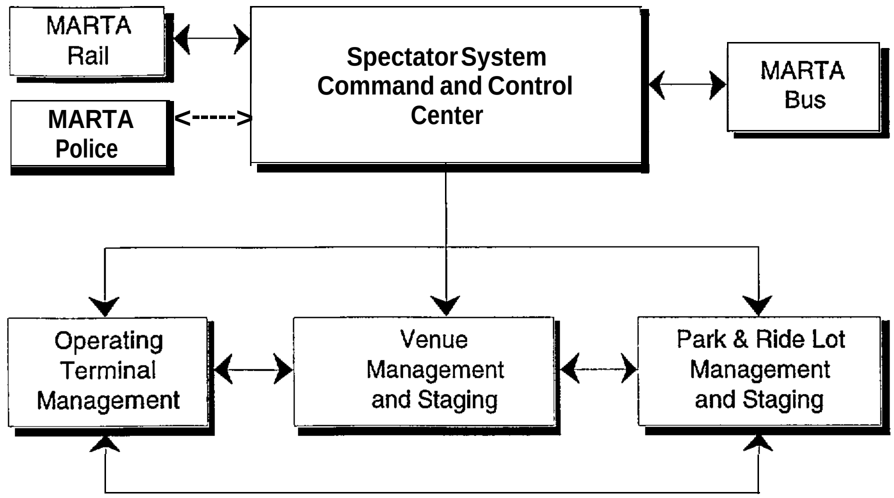


FIGURE 2-3. **OSTS Organizational Structure**

2.2.3.1 Spectator System Command and Control Center

The Spectator System Command and Control Center (SSCCC) was responsible for the central control and coordination of OSTS and **all** its constituent parts. OSTS Bus Radio **Operations was also housed within the SSCCC** and was **responsible for** centralizing and **coordinating** communications involving operational issues and incidents **between** the SSCCC, operating terminals, vehicle operators, MARTA Rail, MARTA **Bus,** Venue Management, and Park & Ride Management. Spectator Communications also acted as the liaison between OSTS bus operations and the ACOG/MARTA towfleet, which was responsible for incident response while vehicles were enroute.

The SSCCC communicated with Venue Management and Staging, Park & Ride Management and Staging, and the Spectator System Operating Terminals (SSOT) to coordinate the efforts of these groups to facilitate transportation throughout OSTS. Communications were also facilitated between the SSCCC and the Transportation Management Control of the Olympic Family System. This communication link was used frequently by the Olympic Family System during periods of heavy travel demand resulting in OSTS buses being transferred as needed to support the Olympic Family shuttle bus service.

The SSCCC included several key players who were responsible for important communications for the smooth and effective operation of OSTS. Figure 2-4 illustrates the flow of communications among the key staff:

- **OSTS Program Manager: The** OSTS **Program** Manager monitored all Spectator Operations on designated radio channels, communicated with the TMC, received and transmitted program schedule changes from ACOG

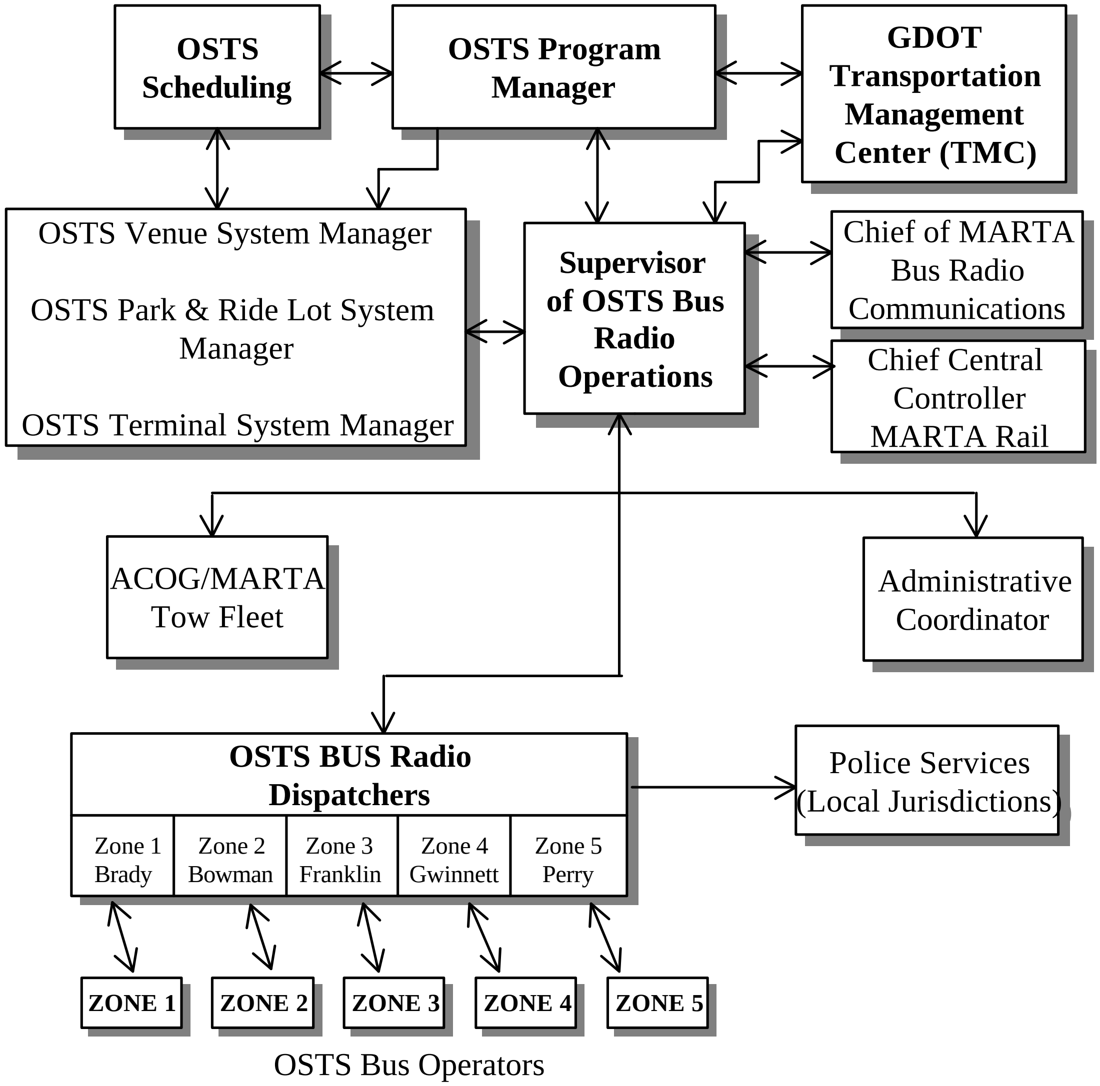


FIGURE 2-4. Spectator System Command and Control Center Flow of Communications

management, and provided quality control management of the entire OSTS operation through on-site (e.g., Park & Ride lots, venue bus staging area) inspections. The OSTS Program Manager communicated frequently, via radio or telephone, with the Chief of OSTS Bus Radio Operations regarding the OSTS, MARTA Rail and MARTA Bus transportation systems, and on an as needed basis with the Olympic Family Transportation Management Center (TMC). Program scheduling changes received from ACOG management were relayed to OSTS Scheduling as necessary. Other responsibilities included in-person communications with the OSTS Venue System Manager, OSTS Park & Ride Lot System Manager, and OSTS Terminal System Manager.

- **Supervisor of OSTS Bus Radio Operations:** The Supervisor of OSTS Bus Radio Operations acted as the central figure, monitoring all OSTS operations on designated radio channels, and communicated directly with the OSTS Program Manager by telephone, radio, and in person regarding all OSTS operational issues. Direct communication was also maintained with the Chief Central Controller of MARTA Rail, the Chief of MARTA Bus Radio Communications in the MARTA TIC, and the Olympic Family TMC. Communications between MARTA Rail and MARTA Bus were important due to their major roles in the connectivity of the entire OSTS operation. The Supervisor of OSTS Bus Radio Operations also managed the radio dispatchers and was the liaison with the MARTA/ACOG towfleet, with full responsibility for their dispatch to assist buses disabled while in service. Other responsibilities included direct communications regarding operational issues with the OSTS Venue System Manager, OSTS Park & Ride Lot Manager, and OSTS Terminal System Manager.

- **OSTS Venue System Manager:** This staff member was responsible for the management of transportation operations and staff at all venues and maintained verbal communications with the OSTS Program Manager and the Chief of Spectator Communications in the SSCCC. OSTS Scheduling informed the OSTS Venue System Manager of any scheduling changes, so that adjustments could be made to venue operations as required. The OSTS Venue System Manager communicated via radio or telephone with the Venue Transportation Coordinators regarding the status of transportation operations and any adjustments to venue operations due to program or service level changes, staff availability, and weather conditions.

- **OSTS Park & Ride Lot System Manager:** This staff member was responsible for the administration of transportation operations and staff at all OSTS Park & Ride lots and maintained verbal communications with the OSTS Program Manager and the Supervisor of OSTS Bus Radio Operations in the SSCCC. OSTS Scheduling informed the OSTS Park & Ride Lot System Manager of any scheduling changes, so that adjustments could be made to Park & Ride lot operations as required. The OSTS Park & Ride Lot System Manager communicated via radio or telephone with the Park & Ride Lot Regional Managers regarding the status of transportation operations and any adjustments to operations due to program or service level changes, staff availability, and weather conditions.

- **OSTS Operating Terminal System Manager:** This staff member was based at the SSCCC and was responsible for the administration of transportation operations and staff at all operating terminals. This staff member maintained verbal communications with the OSTS Program Manager and the Supervisor of OSTS Bus Radio Operations. OSTS Scheduling informed the OSTS Operating Terminal System Manager of any scheduling changes, so that adjustments could be made to terminal operations as required. The OSTS Operating Terminal System Manager communicated via radio or telephone with the Terminal Managers regarding the status of transportation operations and any adjustments to operations due to program or service level changes, staff availability, and weather conditions.

- **Administrative Coordinator:** The Administrative Coordinator processed and filed information received from the Supervisor of OSTS Bus Radio Operations and the OSTS System Managers located in the SSCCC. In addition, the Administrative Coordinator was responsible for filling all dispatcher and supervisor jobs and for recordkeeping for payroll data.

- **OSTS Bus Radio Dispatchers:** The OSTS Bus Radio Dispatchers communicated with OSTS Bus Operators on assigned radio channels and verbally with the Supervisor of OSTS Bus Radio Operations. The dispatchers were located in the SSCCC. One Bus Radio Dispatcher was assigned to each of the terminals on a specific radio channel. Responsibilities included providing instructions to bus operators for transferring buses to other routes, rerouting buses due to traffic problems, and providing directions to lost drivers.

- **OSTS Bus Operators:** The OSTS Bus Operators communicated with OSTS Bus Radio Dispatchers and the Supervisor of OSTS Bus Radio Operations, if necessary, on problems related to bus operations, traffic problems, route directions, accidents, passenger safety, and security.

2.2.3.2 Venue Management and Staging

Venue Management **and** Staging was responsible for all operations of the rail-to-venue **spectator shuttles, as well as the Park** & Ride lot spectator shuttles while they were **loading and unloading** passengers at the venues. Communications were transmitted to related departments regarding the delivery of shuttle bus transportation services to and from the venues and rail stations. Examples of information **needed** included bus breakdowns, schedule delays or changes, **overcrowding, and accidents** enroute. Operational staff assigned to venues maintained communications through the Transportation Supervisor assigned to that particular venue. The Transportation Supervisor was responsible for managing the loading and unloading of spectators, and for staging operations of OSTS buses at the venue site. Venue operations information at this point was conveyed up the chain of command to the assigned Venue Transportation Coordinator, who acted as the liaison between venue transportation staff and the Spectator System Command and Control Center. The assigned Venue Transportation Coordinator also served as the principal point of contact for other functional areas, such as OSTS Venue Management, Olympic Family Transportation, and Security. The Supervisor of Radio Dispatchers for the operating terminals was connected to this communications loop through information transmitted from the Venue Transportation Coordinator.

Figure 2-5 illustrates the flow of communications among the key staff in Venue Management and Staging. The following section provides details on the flow of communications among these staff:

- **Venue Transportation Manager:** The Venue Transportation Manager was responsible for OSTS operations on both ends of the rail station-to-venue spectator shuttles and on the venue end of the Park & Ride lot-to-venue spectator shuttles. Communications regarding operations and spectator flows were maintained via radio (on designated radio channels) or telephone with the OSTS Venue System Manager and ACOG Venue Management. In addition, the Venue Transportation Coordinator maintained verbal contact with the Spectator Bus Supervisor at the venue and radio contact with the Spectator Bus Supervisors at rail stations and Park & Ride lots.
- **Spectator Bus Supervisor (Rail Station to Venue):** The Spectator Bus Supervisor was responsible for loading and unloading, and staging operations. Verbal contact was maintained with the Venue Transportation Manager due to their close proximity with each other in the venue area and via radio (on designated radio channels) or cellular phone with other Spectator Bus Supervisors at venues, rail stations, and Park & Ride lots, as required. In addition, the Spectator Bus Supervisor communicated with the Staging Supervisor and volunteer loaders to coordinate loading and **unloading with** staging operations. Bus operators were also accessible by switching to the appropriate channels in cases of crowd overflows or **emergency** incidents in which buses needed to be held up before they reached the staging areas.
- **Staging Supervisor (Rail Station to Venue):** The Staging Supervisor operated on designated radio channels and was responsible- for the staging operations of the Spectator Fleet as they approached the rail station and venue areas. Communications were maintained with the Spectator Bus Supervisors to **coordinate loading and** unloading at the **rail** station or venue with staging operations from rail stations and Park & Ride lots. Bus Operators could also be contacted to direct bus movements from the staging area to the loading and unloading areas.
- **OSTS Bus Operators:** The OSTS bus operators communicated with the Staging Supervisors to receive instructions to begin or cancel movements from the staging area to the loading and unloading area, and with Spectator Bus Supervisors to receive instructions for leaving the area to begin the route service. OSTS bus operators were also responsible for communicating with the volunteer loaders during the loading and unloading of passengers, to ensure maximum utilization of the vehicle and the safety of the spectators before the vehicle began its route.
- **Volunteer Loader (Rail Station to Venue):** Volunteer loaders were responsible for loading and unloading spectators from buses at rail stations and venues. They communicated with the Spectator Bus Supervisors to coordinate with staging operations.

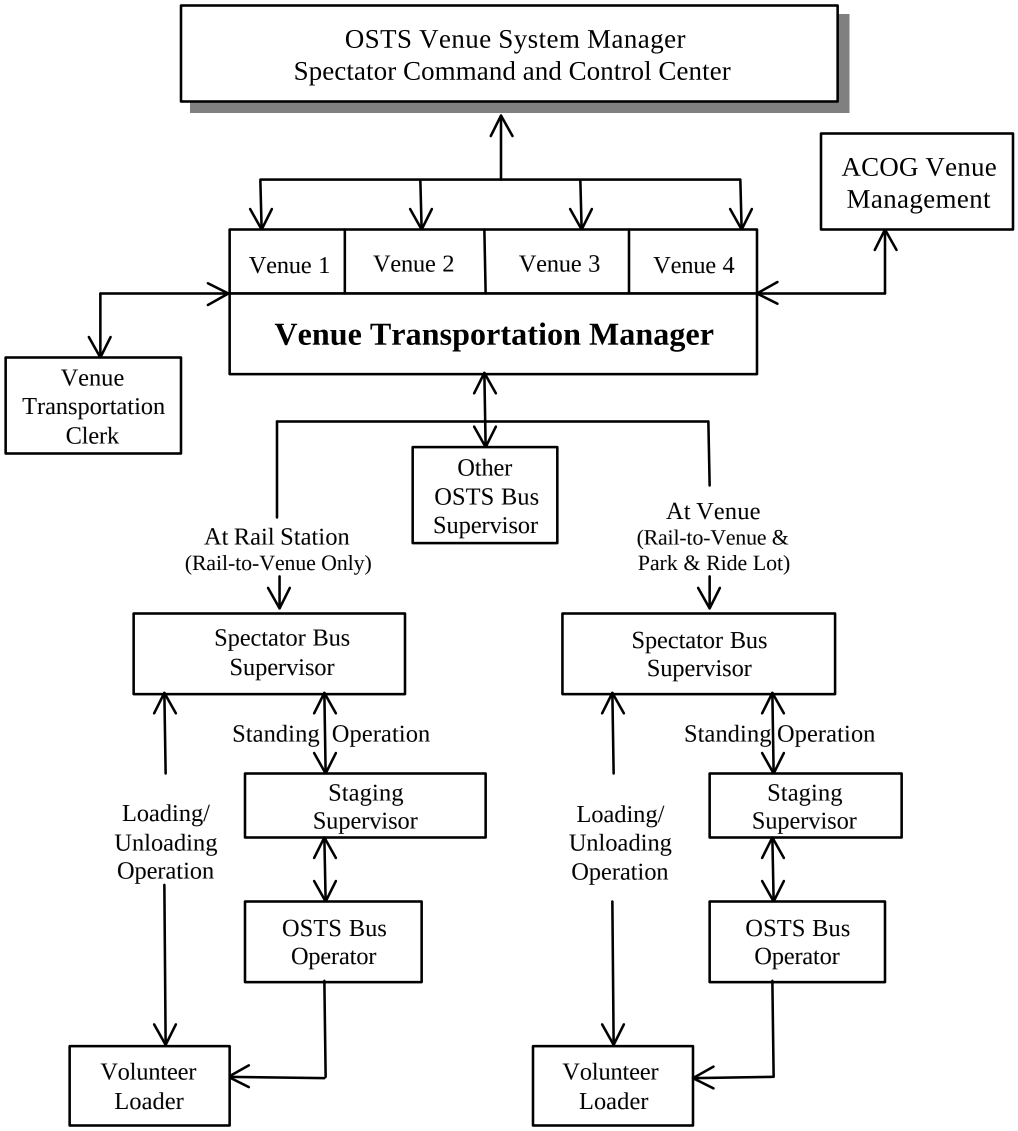


FIGURE 2-5. Venue Management and Staging-Flow of Communications

2.2.3.3 Park & Ride Lot Management and Staging

Park & Ride Lot Management and Staging was primarily responsible for Park & Ride lot operations that required the loading and unloading of passengers, bus staging, and spectator vehicle parking. Operational staff included ACOG employees assigned to each lot as attendants and responsible for collecting parking fees and directing traffic to the proper parking area. Park & Ride Lot Management communicated information regarding shuttle bus transportation services to and from the Park & Ride lot, bus breakdowns, schedule delays and/or changes, and accidents enroute.

Operational staff assigned to the Park & Ride lots maintained communication through the Park & Ride Bus Supervisor overseeing loading and unloading and staging operations, and the Park & Ride Lot Supervisor overseeing parking operations. Information moved up the chain of command, first through the site manager assigned to that particular Park & Ride lot, then to the Regional Area Manager responsible for Park & Ride operations within a particular geographic zone. From this point, the information was sent to the Supervisor of OSTS Bus Radio Operations and then to the Chief of the Spectator System Command and Control Center.

Figure 2-6 illustrates the flow of communications among the key staff in Park & Ride Lot Management and Staging. The following section provides details on the flow of communications among these key staff:

- **Park & Ride Regional Manager:** The Park & Ride Regional Manager was responsible for all Park & Ride lots in the geographical region assigned. Communications were maintained with the OSTS Park & Ride Lot System Manager via radio (on a designated radio channel) or telephone to relay and receive information about current OSTS operations. The Park & Ride Regional Manager also communicated on a different radio channel with other Park & Ride personnel, and with the Spectator Bus Supervisors at other Park & Ride lots, rail stations, and venues. Other responsibilities included maintaining contact with the Site Coordinators regarding the current operations of individual **Park** & Ride lots, and relaying information received from the OSTS Park & **Ride** Lot System Manager in the SSCCC.
- **Site Coordinator: The** Site Coordinator was responsible for the operation of individual Park & Ride lots, including automobile, bus, and pedestrian movements. Communications were maintained via radio (on a designated radio channel) or cellular telephone with the Park & Ride Regional Manager, the Spectator Bus Supervisor (for loading and unloading and staging operations), and the Park & Ride Lot Supervisor (for parking operations).
- **Park & Ride Lot Bus Supervisor:** The Park & Ride Lot Bus Supervisor was responsible for loading and unloading passengers and for staging operations at the Park & Ride lots. Communications were maintained with the Site Coordinator on a verbal basis and via radio (on a designated channel) **or** cellular phone with the Spectator Bus Supervisors at venues, rail stations, and other Park & Ride lots. The Park & Ride Lot Bus Supervisor also communicated with the Staging Supervisor, ticket checkers, and volunteer loaders to coordinate loading and unloading with staging operations and fare collection. In addition, communications were available with the bus operators by switching to their radio channel when necessary.

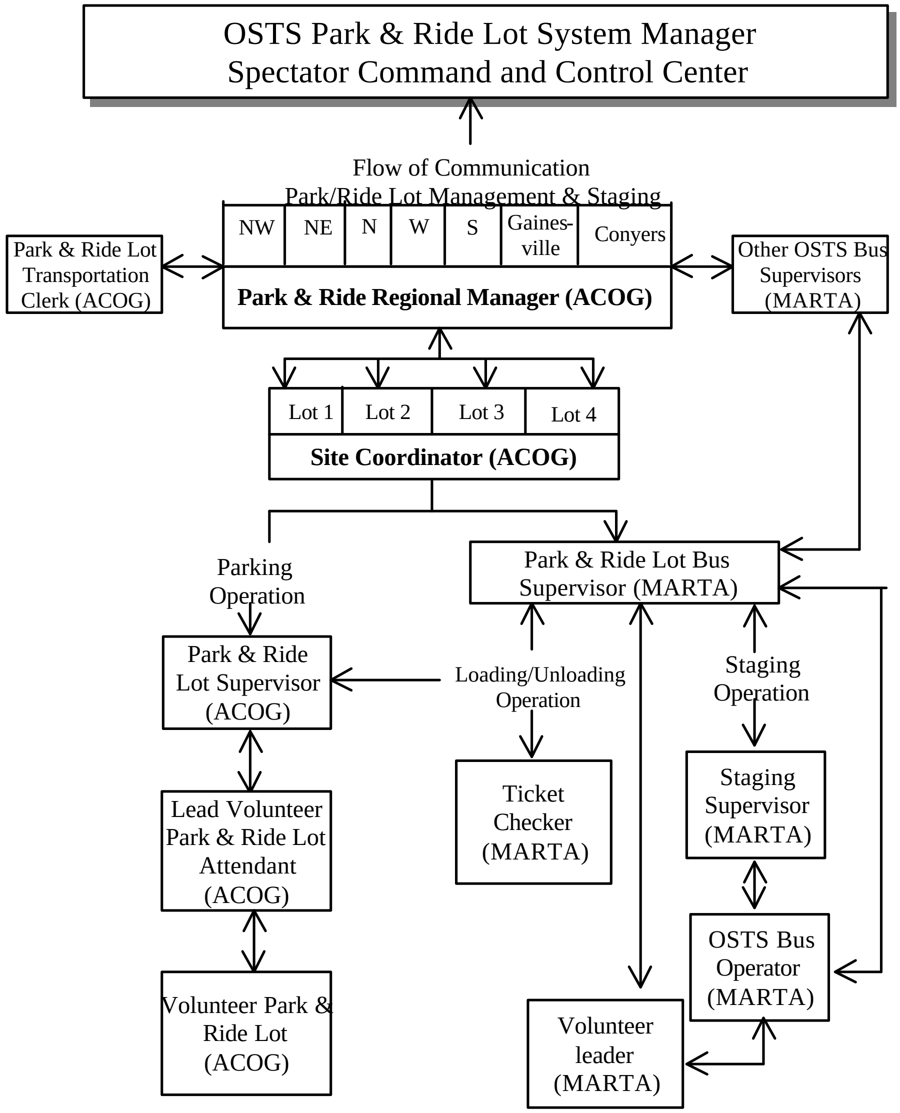


FIGURE 2-6. Park & Ride Lot Management and Staging-- Flow of Communications

- **Ticket Checker (Park & Ride):** The ticket checker checked spectators boarding buses for valid fare media. Valid fare media included an event ticket or a MARTAtranscard. Communications were maintained with the Spectator Bus Supervisor and with Fare Media Sales (for ticketing issues).

- **Staging Supervisor (Park & Ride):** The Staging Supervisor was responsible for staging operations of vehicles prior to their entry into the Park & Ride loading and unloading area. The Staging Supervisor communicated with the Spectator Bus Supervisor via radio (on a designated radio channel) or cellular phone, to coordinate loading and unloading with staging operations, and directly with bus operators to coordinate related bus movements.

- **OSTS Bus Operators:** The OSTS bus operators communicated with the Staging Supervisors to receive instructions to begin movements from the staging area to the loading and unloading area of the Park & Ride lot, and with spectator bus supervisors to receive instructions for leaving this area to begin their routes. OSTS bus operators were also responsible for communicating with the volunteer loaders during passenger loading and unloading, to ensure maximum utilization of the vehicle and safety of the spectators before the vehicle began its route.

- **Volunteer Loaders (Park & Ride):** Volunteer loaders were responsible for spectator loading and unloading from the buses. They communicated with the Spectator Bus Supervisors to coordinate with staging operations.

- **Park & Ride Lot Supervisor-**The Park & Ride Lot Supervisor was responsible for parking operations and communicated with the Site Coordinator and the volunteer Park & Ride lot attendant to coordinate parking activities with loading and unloading and staging operations.

- **Fare Media Sales:** These staff members communicated with the ticket checkers and Park & Ride Lot Supervisor to coordinate efforts to ensure that spectators were properly ticketed.

- **Volunteer Park & Ride Lot Attendant:** This person was responsible for collecting the parking fees from parking spectators, and for the efficient parking of automobiles to maximize the usage of the Park & Ride lots. The attendant communicated with the Park & Ride Lot Supervisor to coordinate parking operations. This was an ACOG function.

2.2.3.4 Operating Terminal Management

The Operating Terminal was responsible for the major functions of spectator bus operations, including: the maintenance and repair of buses used to transport Olympic Games spectators (rail-to-venue shuttle buses and Park & Ride lot shuttle buses), and the scheduling and coordination of all OSTS bus operators. Operating Terminal staff integrated the maintenance and operations of the entire OSTS vehicle fleet loaned from transit agencies across the United States, to meet the service level demands during the Olympic Games.

The Operating Terminals were responsible for communicating issues regarding the operations and availability of the bus fleet, vehicle operator assignments and staffing, and mechanic assignments and staffing. Examples of issues experienced at **the** Operating Terminals included:

- Reassignment of the bus fleet among Operating Terminals, caused by unexpected demand levels or the lack of fleet units due to mechanical failures.

- Reassignment of vehicle operators or mechanics, caused by unavailability or inadequacy of board staff among the Operating Terminals to meet required service levels.
- Incident reporting within the terminal and from vehicle operators enroute, related to such issues as accidents, passenger overflows, parking constraints, and equipment failures.

Operating Terminals maintained communications with the Spectator System Command and Control Center through the Terminal Managers. A Terminal Manager was assigned to each of the Operating Terminals to oversee operation of the terminal, including assignment of work, maintenance, and transportation operations. Operating Terminal staff such as dispatchers, operators, supervisors, and mechanics communicated directly to the Terminal Manager, who then decided on the next level of communication to the SSCCC. Figure 2-7 illustrates the flow of communications among the key staff in Operating Terminal Management. The following section provides details on the flow of communications among these key staff:

- Terminal Manager: The Terminal Manager was responsible for the administration of the Operating Terminal and for monitoring the assigned bus channel. Communications were maintained directly with the Terminal System Manager regarding the operations of all terminals, and with the Venue Managers and Spectator Bus Supervisors through the SSCCC. The **Terminal Manager** communicated verbally as needed with the Operations and Maintenance **Coordinators** on issues regarding operator assignments, service schedule changes, and bus and terminal conditions.
- **Operations Coordinator:** The Operations Coordinator received information from the Terminal Manager regarding route and staff assignments and schedule changes due to rain-outs or postponements and communicated this data to the Chief Division Dispatcher so adjustments to staffing and service levels could be made. The Operations Coordinator also communicated information to the Terminal Manager and Route Supervisor regarding service level adjustments made and difficulties encountered.
- **Route Supervisor: The Route** Supervisor was responsible for overseeing the execution of all OSTS routes emanating from the Operating Terminal and for responding to any bus breakdowns or accidents. The Route Supervisor was based at an Operating Terminal, but supervised from an automobile along assigned routes. Communications were maintained with the Operations Coordinator and bus operators regarding any bus incidents, to coordinate response activities. The Route **Supervisor responded in person to vehicle** accidents or breakdowns, to determine the best possible response actions.
- **Chief Division Dispatcher:** The Chief Division Dispatcher was responsible for receiving bus operator assignments from Division Dispatchers and informing

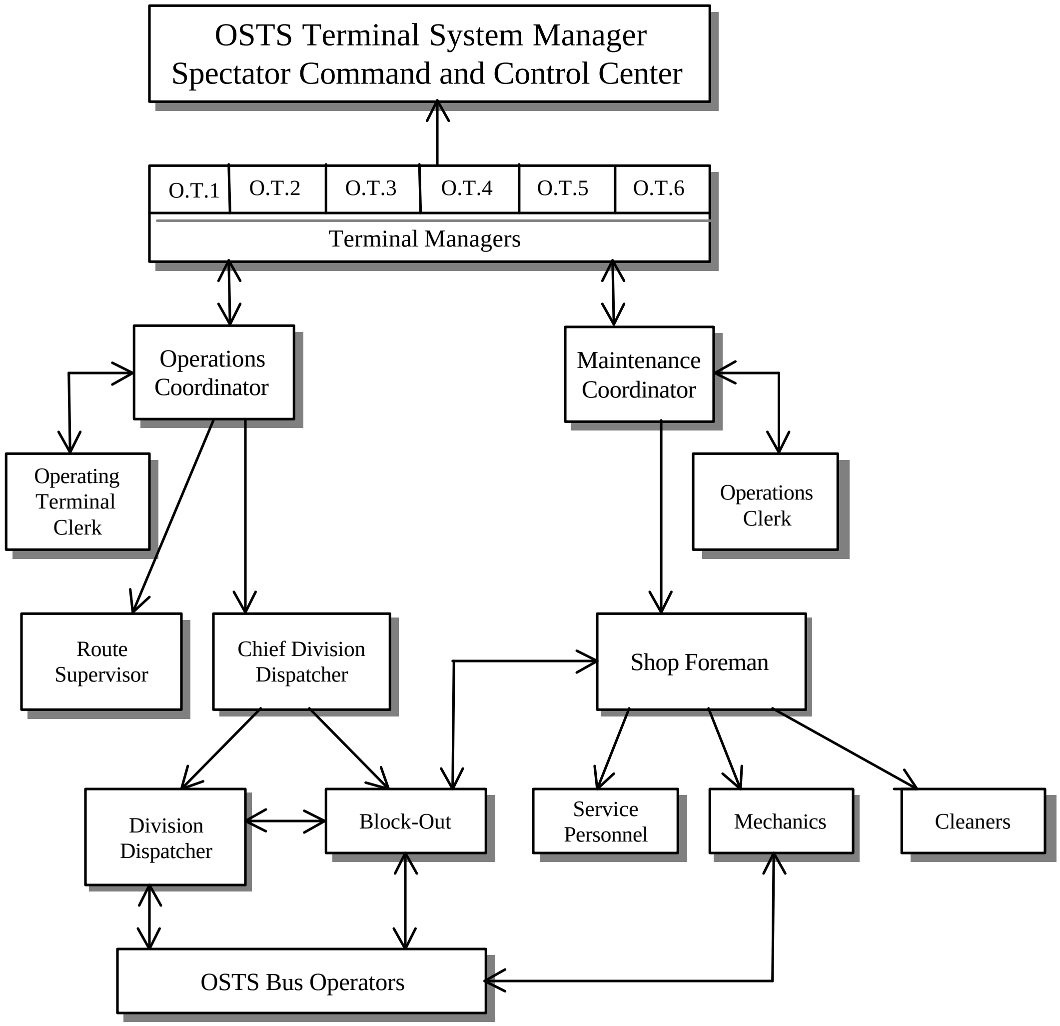


FIGURE 2-7. Operating Terminal Management-Flow of Communications

them of any schedule changes. This staff person communicated in person with the Operations Coordinator on issues regarding staffing assignments and schedule changes, and informed the Block-Out of any schedule changes made by the SSCCC.

• **Block-Out:** The Block-Out was responsible for recording the conditions and locations of all buses assigned to the Operating Terminal, and for separating these buses into those in good working order and those requiring attention by maintenance personnel. The Block-Out assigned buses to each route for every shift, as well as the location of the buses on the terminal lot. This information was recorded on a block-out sheet and faxed to the Supervisor of OSTS Bus Radio Operations for distribution to the Bus Radio Dispatchers.

The block-out sheet was also given to the Division Dispatcher for posting in the operating terminal. Frequent communications were maintained with the Chief Division Dispatcher on schedule changes, and verbal communications were exchanged with bus operators and the Shop Foreman to evaluate the operating status of each bus as it entered the operating terminal.

- Division Dispatcher: The Division Dispatcher was responsible for assigning bus operators to each run scheduled for the next day's shifts, and for reassigning staff that could not make their shift. The Division Dispatcher posted operator assignments and block-out sheets in the Operating Terminal to inform staff of their assignments, and to provide bus availability and location information. The Division Dispatcher also distributed radios to all bus operators and maintained in-person communications with the bus operators and Shop Foreman to discuss vehicle problems as they were returned to the Operating Terminal and evaluated for service the next day.

- OSTS Bus Operators: The bus operators were responsible for operating vehicles along assigned routes as received from the Division Dispatcher. They also communicated frequently with the Bus Radio Dispatchers and the Chief of Spectator Communications when necessary to report bus incidents such as breakdowns, accidents, or the need for route directions. The bus operators maintained communications with the Division Dispatchers regarding their availability for assigned shifts **and** at the end of their shifts, they reported to Block-Out regarding vehicle maintenance problems.

- **Maintenance Coordinator: The** Maintenance Coordinator was responsible for maintenance and repair of buses assigned to the Operating Terminal, and for communicating directly with the Terminal Manager regarding operations of the garage and with the Block-Out to determine the availability of operable buses. The Maintenance Coordinator also communicated with the Shop Foreman regarding the status of current repairs and new repairs required on buses.

- **Shop Foreman:** The Shop Foreman was responsible for the repair and maintenance of all buses in the Operating Terminal, coordinating the efforts of the service personnel, mechanics, and cleaners. The Shop Foreman verbally communicated with the service personnel to direct bus movements within the terminals, and with the mechanics to ensure completion of all vehicle maintenance and repair activities.

- **Service** Personnel: The service personnel were responsible for vehicle movements within the Operating Terminal, based on direct communications with the Shop Foreman.

- **Mechanics:** The mechanics were responsible for the maintenance and repair of buses assigned to the Operating Terminal, both in and out of service. They maintained communications via radio with the bus operators and Route Supervisors during incidents involving mechanical failures enroute.

2.2.3.5 MARTA Bus

The MARTA Bus Communications Center, also known as the MARTA Transit Information Center (TIC) since the implementation of ATMS prior to the Olympic Games, was responsible for the operations of the regular MARTA Bus system and for coordination with the OSTS service operated simultaneously during the Olympic Games. As part of the implementation of the regional ATMS, the MARTA Bus Communications Center was transformed into the MARTA TIC with the installation of a direct communications link to the TMC and TCCs. The MARTA TIC was the central control center for MARTA fixed-route bus service, providing communications, radio dispatching, service-level monitoring, and incident response.

MARTA Bus operations relative to OSTS relied on the communications link between the MARTA TIC and the SSCCC. This link was maintained by the MARTA Chief of Radio Communications and the Supervisor of OSTS Bus Radio Operations. This enabled the MARTA Chief of Radio Communications to communicate directly with the SSCCC in an effort to coordinate the services of MARTA Bus and OSTS, to ensure that maximum service levels were attained and transit incidents were resolved in an efficient and effective manner. In addition, as part of the regional ATMS, the **MARTA TIC** had the ability to transmit and receive communications with the TMC through a direct phone line installed in the TIC communications room. **Figure** 2-8 illustrates the flow of communications among the key staff in the **MARTA** TIC, and the following section provides details on the flow of communications among these key staff:

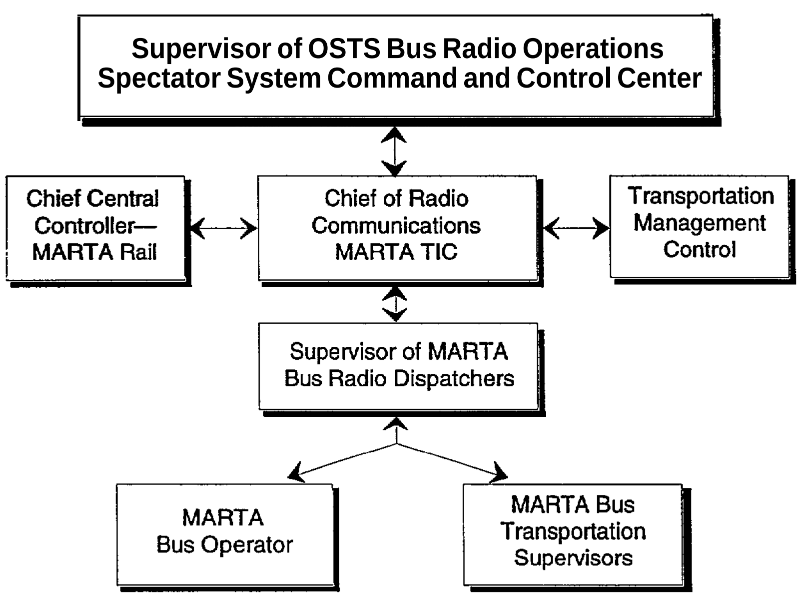


FIGURE 2-8. MARTA Bus-Flow of Communication

- **MARTA Chief of Radio Communications:** The Chief of Radio Communications was responsible for coordinating communications within the MARTA Bus system, on original MARTA radio channels. In addition, the Chief communicated in person or by radio with the Supervisor of OSTS Bus Radio Operations regarding the impacts of OSTS on regular MARTA service and vice versa. Communications were maintained with the Chief Controller of MARTA Rail Operations, to coordinate service between MARTA Bus and Rail services.
- **Supervisor of MARTA Bus Radio Dispatcher:** This supervisor was responsible for all communications within MARTA Bus services and communicated directly with the Chief of Radio Communications and the bus operators. In addition, the MARTA Bus Radio Dispatcher communicated via radio or telephone with the various MARTA Bus Transportation Supervisors.
- **MARTA Bus Transportation Supervisor:** This supervisor was responsible for MARTA Bus services emanating from each division terminal, utilizing radio or telephone communications with the MARTA Bus Radio Dispatcher.
- **MARTA Bus Operators:** The bus operators were responsible for operating **their assigned buses along** specific routes, and for communicating with the MARTA Bus Radio Dispatchers as needed.

2.2.3.6 MARTA Rail

MARTA Rail was responsible for the operation of the entire rail system, accommodating regular passengers as well as spectators moving to and from Olympic Games **venues.** Communications for MARTA Rail operations relied on a link between the Rail Central Control Center, the MARTA TIC (normal procedure), and the SSCCC. This Iink was maintained by the Chief Central Controller at MARTA Rail and the Supervisor of OSTS Bus Radio Operations.

Figure 2-9 illustrates the flow of communications among the key staff in MARTA Rail, and the following section provides details on the flow of communications among these key staff:

- **Chief Central Controller:** The Chief Central Controller was responsible for the enhanced operations of the MARTA Rail system that served the Olympic spectators and the regular MARTA patrons. Communications regarding the status of the rail system were maintained via radio or telephone with the Supervisor of OSTS Bus Radio Operations and the MARTA Chief of Radio Communications. In addition, the Chief Central Controller communicated with the Train Controllers and the train operator regarding current operations of the rail system and any incidents requiring response actions.

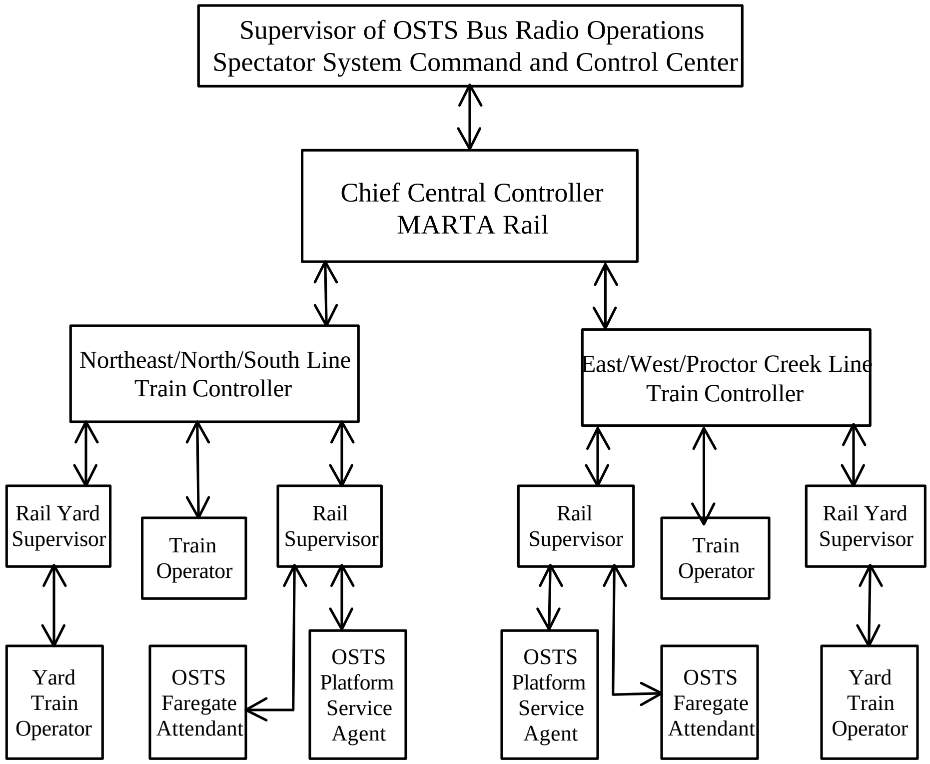


Figure 2-9. MARTA Rail--Flow of Communications

- **Train Controllers:** The Train Controllers were responsible for the safe operation of the trains along the fixed guideway. They communicated directly with the Chief Central Controller regarding current operations of the rail system. Train Controllers also communicated by radio or telephone with the Rail Yard Supervisors, Rail Supervisors, and train operators, to ensure the efficient and safe movement of trains from rail yards and along the fixed guideway through the stations.

- **Rail Supervisors:** The Rail Supervisors were responsible for the operations of rail stations. They communicated with the Train Controller regarding train movements through rail stations and with OSTS faregate attendants and platform service agents to ensure smooth passenger access to the rail network.

- **Rail Yard Supervisor:** These supervisors were responsible for the operations of the rail yard, including vehicles maintenance and train configurations. They communicated with the Train Controller regarding scheduling of trains and operations of the rail yard. In addition, the Rail Yard Supervisor communicated with the yard train operators to identify the locations of rail cars and train "consists" (number of coaches in a train).

- **Train Operators:** The train operators were responsible for train movements along the guideway to transport revenue service passenger. They communicated with the appropriate Train Controller regarding train operations and any equipment or passenger incidents that occurred along the guideway or in the stations.

- **Yard Train Operators:** The yard train operators were responsible for the movement of rail cars in the rail yard and for the assembly of train consists. They communicated with the Rail Yard Supervisor regarding the location of rail cars in the yard and specific cars to be used to develop consists.

2.2.3.7 MARTA Police

MARTA Police was responsible for the safety and security of the combined MARTA Bus and Rail service and OSTS operations. Communications for MARTA Police relied on links with the MARTA Rail, the MARTA TIC, and the Spectator System Command and Control Center. This link was maintained by the MARTA Police Chief, the MARTA Chief of Radio Communications, the Chief Train Controller, and the Supervisor of OSTS Bus Radio Operations. Figure 2-10 illustrates the flow of communications among the key staff in the MARTA Police. The MARTA Police Radio Operations department was responsible for receiving incoming calls from any of these departments, or from passengers throughout the MARTA system via **phones** placed at rail stations or bus connection bays. MARTA Police then responded to these communications, based on the location and severity of the **incident.**

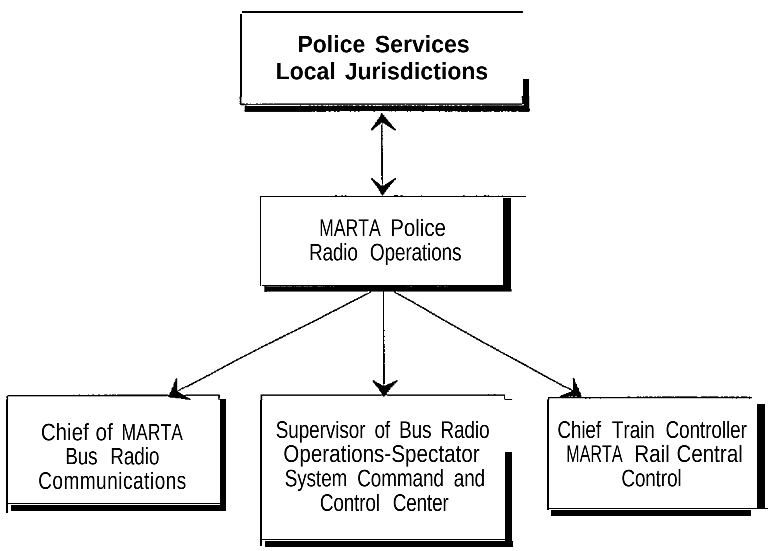


FIGURE 2-10. MARTA Police--Flow of Communications

2.2.4 Freeway Enforcement Structure

Primary enforcement responsibilities on the interstate freeway system in Atlanta are divided between GDOT and the Atlanta Police Department (APD). GDOT is responsible for issuing permits related to truck movements on the interstate, and for enforcing trucking laws. However, during the Olympic Games, the Georgia State Patrol (GSP) took over truck permit and enforcement duties as part of their involvement with the State Olympics Law Enforcement Command (SOLEC) to ensure security during the games. Within Atlanta's borders, all other enforcement (moving violations, etc.) and accident responses were the responsibility of the APD, with support from the GSP, if requested. Outside the city, enforcement was the primary responsibility of the GSP, with support from local police agencies, if requested.

2.3 THE PARALYMPIC GAMES

The Paralympic Transportation System (PTS) was established by the Atlanta Paralympic Organizing Committee (APOC) to provide safe, dependable, and efficient transportation for participants and guests of the 1996 Paralympic Games. The PTS provided transportation services for the Paralympic Family.

2.3.1 Paralympic Transportation System Description

The PTS focused primarily on providing service to approximately 3,300 athletes, their coaches, team staff, officials, technical personnel, and Paralympic Family members. No special spectator transportation system was provided as part of the Paralympic Games, since the PTS did not have to contend with the large passenger volumes associated with the Olympic Games. However, the Paralympic Games presented other challenges that had to be addressed. For example, approximately 1,200 of the 3,300 athletes used wheelchairs, impacting service and resource requirements.

In addition, the nature of the competition and the classification of athletes in the days immediately prior to the Paralympic Games led to changes in the venue competition times. Athletes were classified based on disability, so the number of athletes competing at a **certain time** was determined by the results of the classification once the athletes arrived in Atlanta. APOC was then required to change bus schedules on short notice to meet the changes in competition times and lengths. This required a great deal of flexibility in the overall scheduling and operation of the PTS.

The following PTS description includes bus schedules, routing, special services, and the Transportation Mall at the Paralympic Village. Also described are the arrangements for spectator transportation, including APOC shuttles.

2.3.1.1 PTS Bus Schedules

PTS bus schedules were developed through a joint effort between MARTA and APOC. These schedules were based on competition schedules provided to the APOC Transportation Department.

PTS commenced operations on August 13, two days before the Opening Ceremony. APOC experienced some difficulty adhering to scheduled operations, with delays of up to 2 h in some cases. This was due to buses departing late from the Brady Terminal, the maintenance facility responsible for serving and dispatching the PTS bus fleet. Other buses had difficulty meeting schedule requirements. Also, the schedules for buses operating out of the Brady Terminal were changed from the initial plans after the first few days of the Paralympic Games. This involved changing the timing of the bus schedules to meet competition adjustments resulting from the classification of athletes.

2.3.1.2 Routing

Paralympic Games bus routes originated from two primary locations: the Paralympic Village on the Georgia Tech campus, and the Marriott Marquis Hotel in downtown Atlanta. Routes were developed by APOC in consultation with MARTA, from these origins to venue destinations located throughout the region.

Some of the bus routes were altered over the course of the Paralympic Games to meet changes in athletic competition schedules. Other routes were modified to allocate resources more effectively to meet service demand. For example, APOC initially provided two shuttle routes from the Georgia Tech Aquatic Center to the MARTA Midtown Rail Station. One shuttle was designed for spectators, the other was intended to be used exclusively for officials and volunteer staff. As the Games progressed, APOC decided to combine services to remove overlapping and unnecessary special service for the officials and volunteer staff: staff members were directed to take the spectator shuttle.

2.3.1.3 Special Services

At the start of the Paralympic Games, APOC provided special, individual transportation services for VIPs, dignitaries, and coaches. This system used vans and cars from the ACOG motor-pool fleet and provided service to venues and other Paralympic Games events from host hotels.

Problems with these special services interrupted normal athlete operations during the first few days of the Paralympic Games. APOC decided to discontinue the special services operations in order to focus on athlete transportation. For example, officials requesting special transportation to the airport during the Paralympic Games were directed to arrange their own transportation using MARTA or taxicabs.

APOC did provide an airport shuttle as the Paralympic Games concluded, using the bus fleet, but did not offer the individual transportation services initially provided.

2.3.1.4 Paralympic Village Transportation Mall Zone

The majority of the transportation services centered around the Paralympic Village, which housed more than 5,000 persons. The Village was located on the northwest corner of the Georgia Tech campus, where housing facilities were most accessible to those who are disabled. To facilitate transportation at the Paralympic Village, APOC instituted a Transportation Mall Zone for departing and returning buses. This area was located on the east side of the Paralympic Village, near the intersection of 10th Street and Delaney Avenue. APOC operated a shuttle system throughout the Paralympic Village, providing transportation to the Zone.

Transportation access at the Transportation Mall Zone was restricted, with a limited turning radius for buses entering and exiting the area. This made it difficult for buses to turn into and out of adjacent streets. Georgia Tech campus police were stationed nearby to assist with buses turning into and out of the Transportation Mall **Zone.** Originally, only one holding area at the Transportation Mall **Zone was** planned. An additional holding area was later set up at the Aquatic Center, to handle extra buses sent to that location because of space restrictions at the Transportation Mall **Zone.**

In addition to the Village, the Marriott Marquis hotel acted as the host hotel for 1,800 to 2,000 Paralympic Family members. Transportation service was provided from this **site,** as well, with service to venues and the Paralympic Village.

2.3.1.5 Spectator Transportation

APOC coordinated closely with MARTA in the development of the plans for spectator transportation. MARTA made several accommodations to its normal operations in order to accommodate the Paralympic Games. Since special **Paralympic** spectator transportation was not provided, spectators were encouraged to use regular MARTA service for access to venues and Paralympic activities. In contrast to the Olympic Games, Paralympic Games spectator tickets or credentials did not permit free access to the MARTA system.

Initially, a shuttle service from MARTA Rail stations to the Olympic Stadium was not planned. However, as the Paralympic Games approached, MARTA offered to operate a spectator shuttle bus from the West End Station to the Olympic Stadium during the Paralympic Games. This decision was made in order to provide better accessibility to the venue.

This shuttle service used up to 30 buses (primarily low-floor buses). The shuttle followed the route of the corresponding shuttle developed for the Olympic Games.

However, the Paralympic Games shuttle bus loading and drop-off area was located closer to the Olympic Stadium. The shuttle schedule was as follows:

- Opening Ceremonies: August 15, 1996, from 6:00 p.m. until venue cleared.
- Athletic Events: August 17 through August 25, 1996, from 7:00 a.m. until 11:00 p.m.
- Closing Ceremonies: August 25, 1996, from 6:00 p.m. until venue cleared.

Spectators were permitted to ride the shuttle buses without paying a fare.

MARTA supplemented the shuttle bus fleet with L-vans, which are lift-equipped vehicles used by MARTA for its paratransit service, for both the opening and closing ceremonies. To accommodate the late completion of the opening and closing ceremonies, MARTA extended its rail service on August 15 and 25. In addition, MARTA continued to provide its shuttle from the Atlanta-Fulton County Stadium to the Five Points Station on Braves' game days, and spectators for the Paralympic Games were permitted to use this shuttle free of charge, as well.

MARTA also identified rail stations that would be heavily used by disabled persons during the Paralyrnpic Games. Additional staffing was provided to ensure adequate availability of MARTA volunteers and maintenance personnel for elevators, escalators, **and faregate service and patron assistance. The following stations were identified as requiring special attention during the Paralympic Games:**

- **Airport**
- **Avondale**
- **Georgia State**
- **Midtown**
- **Peachtree Center**
- **Ashby**
- **Five Points**
- **Lenox**
- Omni
- **West End**

2.3.1.6 APOC Shuttles

APOC also operated special spectator shuttles, utilizing the loaned buses remaining from the OTS fleet and operated by Department of Defense drivers. Three spectator shuttles were operated at no cost to riders, serving the following stations and locations:

- Midtown to Aquatic Center.
- Ashby to Clark Atlanta University Center.
- Hugh Howell Park & Ride Lot to Stone Mountain **Venues.**

As the Paralympic Games began, MARTA supplemented the APOC Midtown to Aquatic Center service with L-van service, to provide additional accessible vehicles for riders who required special assistance along the route.

2.3.2 Organizational Structure

The organizational structure for transportation management during the Paralympic Games is illustrated in Figure 2-11.

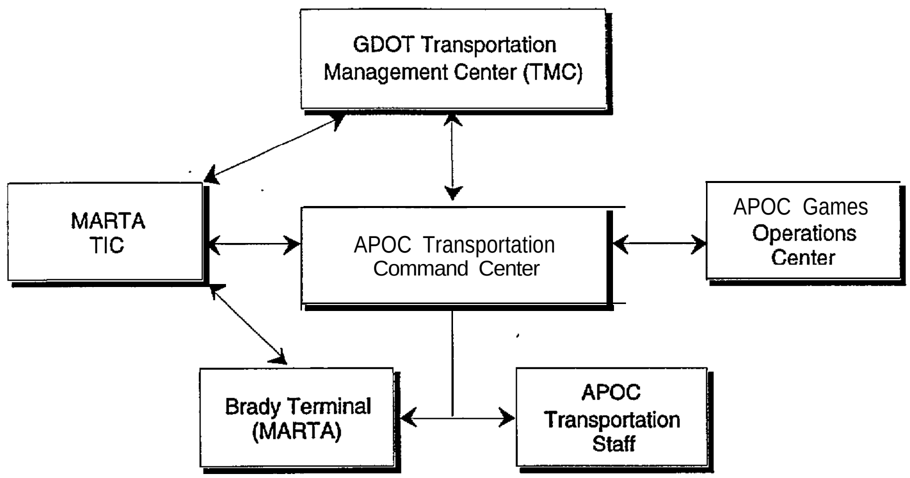


FIGURE 2-11. Organizational Structure for Transportation Management During the Paralympic Games

The organizational structure included all management and operational areas required to operate the PTS. During the Paralympic Games, the roles of the TMC and TCCs were essentially the same as for the Olympic Games, with some additional functionality in the TCCs as more CCTV cameras came on line. The MARTA TIC participated in a manner similar to its role in the implementation of the OTS for the Olympic Games. Descriptions of the roles of these departments are found in previous discussions. The Command Table and the Resource Table were on standby during the Paralympic Games, but were not required and were therefore not activated. ATOC was also deemed unnecessary and was disbanded.

The additional key departments in the final organizational structure included:

- **APOC Transportation Command Center (TCC):** This department provided the APOC Director of Transportation with the capability to integrate, control and manage the overall transportation resources available to the PTS.
- **APOC** GOC: This department was responsible for scheduling the games and the training sessions at the venues. It was located in the same building as the APOC TCC.

- **Brady Terminal (MARTA):** This department was the operating and maintenance facility responsible for servicing and dispatching the PTS bus fleet.
- **APOC Transportation Staff:** This department was the PTS management team composed of the Directors of Venue Operations, Bus Systems, Motorpool, Airport, and Staffing.

2.3.3 Communications Plan

The lines of communication for each of the agencies and departments depended on their role in the PTS. The TMC had report lines with APOC and the MARTA TIC. The TMC's role was to provide information to the MARTA TIC regarding highway traffic conditions and incidents. The APOC TCC, at the center of the organizational structure, served as the focal point for real-time information on all phases of the PTS. Brady Terminal and the APOC Transportation Staff reported directly to the APOC TCC. Brady Terminal served as the central radio control room for the PTS bus fleet operations, and therefore communicated directly with the MARTA TIC and the TMC.

2.4 SUMMARY: AGENCY TRANSPORTATION ROLES

The transportation roles of each agency during the Olympic and Paralympic Games are summarized in Table 2-2. This table is based on the views expressed by **individual agencies at the post-Games workshop.**

2.5 TRAVEL DEMAND FORECASTS AND MANAGEMENT

As **stated earlier in this report,** one of the most significant issues affecting the arrangements for the Atlanta Olympic Games was the location of all the major sporting venues within the Olympic Ring. ACOG decided that rather than risk traffic gridlock, no parking spaces would be made available to spectators at these venues, effectively obligating ACOG to provide transit options for spectators, through the OSTS. This section describes the travel demand forecasts that were made to support OSTS planning, and the travel demand management (TDM) plans developed to encourage local residents to change their travel patterns during the Olympic Games.

TABLE 2-2. Agency Transportation Roles During the Games

Agency	Transportation Role
ACOG	• Provide overall coordination and ensuring implementation of elements of the plan for the Olympic Games. • Implementation required interagency coordination. • Identify other agencies to step in and provide parts of system.
APD	Within the city of Atlanta: • On-street manned traffic control. • Enforcement on freeways. • Maintenance of a centralized traffic communications center to manage the above (Olympic Games only) .
APOC	• Plan, implement, and manage the official transportation service for the Paralympic Games.
ARC	• Planning and programming. • Inform metro area businesses and residents of expected impacts of OTS on ordinary travel. • Assistance to same in establishing procedures to minimize those impacts. • Minimize impact on movement of goods. • Provide staff to ACOG. • Act as planning arm of ACOG. • Incident task force. • Commute Connections Network—minimize impacts.
City of Atlanta	• Permitting for street closures. • Monitoring of traffic operations within the city of Atlanta. • Response to requests for traffic signal re-timing.
Clayton County	• Be involved in coordination of activities. • Provide technical support and local knowledge to various agencies, including GDOT, ACOG, and MARTA. • Operation of routes used by spectators and Olympic Family.
Cobb County	• Minimize the impact of the Olympic Games on the success of their mission (the safe and efficient travel of people throughout Cobb County) .
De Kalb County	• Monitor and have emergency standby. • Implement predetermined or unexpected changes on demand.
FHWA	• Liaison, including the Information Resource Center (IRC) . • Provide assistance when needed—be a team player. • Provide a " removed" perspective of the big picture.
FTA	• Promote a positive image of transit. • Portray the Federal Government as a partner in a public/private partnership. • Provide assistance to MARTA, ACOG, and APOC specific to mission (enhance mobility and provide technical and financial assistance to transit service providers) . • Ensure delivery of 1500 buses. • Provide oversight to ensure prudent expenditure of public funds.
Fulton County	• Monitor and maintain traffic flow within the county.
GDOT	• Infrastructure responsibility. • Lead operations on state and federal system. • Coordinator and facilitator for local jurisdictions.
Georgia Emergency Management Agency (GEMA)	• Available on an on-call basis to assist in the event of a major incident.
Gwinnett County	• Provide traffic control at Park & Ride lots and tennis venue. • Traffic plans for transportation corridors. • Provide communications link between law enforcement and state and county DOT personnel using TCC, and between Gwinnett 911 and the TMC. • Quick response and mitigation of incidents affecting transportation corridor.
GSP	Combined with PSC and GDOT enforcement to form "in-transit." • Provide for safe and efficient movement of vehicles transporting accredited athletes and officials between competition and training sites.
MARTA	Official provider of spectator transportation for the Olympic and Paralympic Games. • Establish spectator communications system. • Supplement add-on fleet as needed. • Olympic Family fleet maintenance. • Expand existing network. • Expand bus and rail service to 24-h operation. • Train bus operators and mechanics for Olympic Spectator and Olympic Family fleets. • Delivery and return of loaned buses. • Public information provider for the spectator system.
SOLEC	• Overall Olympic Games security, including transportation system monitoring and response.

Source: Workshop organized by Booz-Allen & Hamilton

2.5.1 Travel Demand Forecasts

The Olympic Transportation Information System (OTIS) was the primary source of travel demand forecasts for the Olympic Games. The foundation of OTIS was a programmable database that included:

- Event schedules.
- Housing locations.
- Venues.
- Park & Rides lots.
- Other origins and destinations.
- Athlete schedules.
- Projected spectator, media, athlete, officials, and other demands.
- Projected mode splits.

OTIS produced estimates of the total event-related multimodal transportation demand. The system was not intended to produce on-street traffic assignments. The Atlanta Regional Commission (ARC) led the coordinated effort to develop OTIS, with assistance from a consultant.

For the Paralympic Games, the Transportation Information Management System (TIMS) was the primary source of travel demand forecasts. Paralympic schedules, projected mode splits, media transportation needs, and other requirements were input by APOC to TIMS. Again, the output was the total event-related travel demand, and no attempt was made to forecast volumes on individual links of the transportation system.

TIMS was **much** less **complex** than OTIS, because it did not address spectator transportation. However, travel demand forecasting for the Paralympic Games was complicated by two factors:

- This was the first time that the complete set of summer events for the Paralympic Games had been held in the United States. There was uncertainty as to the level of spectator interest.
- This uncertainty was exacerbated by the fact that the Atlanta Paralympic Games were the first to charge admission for the events, other than the Opening and Closing Ceremonies.

2.5.2 Travel Demand Management

Prior to the Olympics, there were major concerns about the possibility of heavy traffic volumes and the consequential extensive delays that might affect the movement of athletes and spectators. Within the Olympic Ring, there were further concerns about the potential impact of traffic congestion on deliveries to venues and businesses, truck-generated traffic delays, and security at Olympic venues and sites.

Consequently, a travel demand management plan was developed and implemented in advance of the Olympic Games. The plan comprised two components:

- Regional commute trip reduction.
- Freight management plan for local and long-haul movements.

2.5.2.1 Regional Commute Trip Reduction

This was the first time that the Atlanta region had aggressively pursued any employer based TDM programs. ACOG began the program with an information campaign in 1995. ARC provided technical direct assistance to employers through its Commute *Connections* Network program (CCN), which began in January 1996. CCN provided complete data collection, planning and marketing services to employers at no cost, to assist in developing a commute trip reduction program. The services included transportation demand management planning, commuter surveys, customized reports and evaluations, computerized ridematching, and training for on-site coordinators to continue the program after CCN helped initiate it. Comprehensive commute trip reduction strategies were included in programs designed by CCN. Transit, carpooling, vanpooling, bicycling, walking, variable work schedules, telecommuting, guaranteed ride home, parking management, employee incentives, and promotional materials were all part of the CCN service. Although the Olympic Games were the initial focus of this program, ARC's intent was that TDM plans should continue after the games.

CCN sent mailers to 10,000 firms, from which 450 requests for assistance were returned. Forty-five percent of replies, most of which were from the downtown area, asked for both Olympics and long-term TDM planning, and 350 ride-matching kits were sent out. ARC planned to undertake its own follow-up survey to determine the actual extent of the Olympic TDM Plan, including which TDM strategies were employed and how many commuters were affected. The results will be available in 1997.

2.5.2.2 Freight Management Plan

The main components of the freight management plan were as follows:

- Olympic Ring site:
  - Only trucks (and cars) with permits were allowed between 7:00 a.m. and 11:00 p.m., unless off-street loading zones were available.
  - Permits were provided in limited quantity to businesses that used only on-street loading zones. Permits could be distributed to delivery companies at the business' discretion.
  - Most shipment deliveries/loadings were to occur between midnight and 6:00 a.m.
  - Businesses stockpiled supplies and changed work locations to reduce freight demand.
- Long-haul trucking and intermodal operations:
  - Trucks were encouraged not to use freeways inside the I-285 perimeter (although it is standard practice for through trucks to be banned from doing so).
  - Trucks changed to nighttime operations for intermodal yard deliveries.
  - Some intermodal (rail-truck) container handling was relocated to a yard remote from the Olympic Ring.

2.6 SUMMARY: OLYMPIC GAMES TRAVEL DEMAND STATISTICS

Travel demand statistics were collected as part of the overall data collection activity. This information is presented here in order to set an overall context for the relative travel demands placed on the transportation infrastructure during the Olympic Games. This information covers freeway usage and public transit ridership.

2.6.1 Freeway Usage

Based on information provided by GDOT, daily traffic patterns during the Olympic Games were modified as follows:

- Radials (I-75, I-85, and I-20) down 4 to 6 percent.
- I-285 perimeter up 4 to 11 percent.
- I-75/1-85 connector about the same, but with a different vehicle mix, e.g., more buses than usual.

- Peak periods more spread out than normal weekdays, and the peak flows were up to 30 percent less than on normal weekdays.

During the Olympic Games, ozone levels were measured to be 30 to 50 percent lower than normal, possibly as a consequence of the above.

2.6.2 Public Transit Ridership

Ridership data for OSTS were collected on a daily basis during the Olympic Games from daily summary reports produced for MARTA by Parsons Brinckerhoff/Tudor. Additional information was obtained from the MARTA Scheduling and Monitoring Department, which was the source of all reported ridership data for MARTA Rail, MARTA Bus, and the Olympic spectator shuttle buses.

2.6.2.1 MARTA Fixed-Route Service

Table 2-3 presents "unlinked" daily passenger trips for MARTA fixed-route service during the Olympic Games. MARTA fixed-route service included both rail and bus unlinked passenger trips. An unlinked passenger trip was a one-way trip on a single mode of transit. For example, a passenger traveling by bus to a rail station and then transferring to the rail system to the destination would be counted as one unlinked bus trip and one unlinked rail trip. Similarly, a passenger traveling by rail on the North Line Extension to Five Points Station, then transferring to the East Line, would be counted as two unlinked rail trips.

An explanation of the columns in Table 2-3 is as follows:

- **Rail Faregate UL Trips:** Represents passenger boardings as counted at the turnstiles located in each of the MARTA Rail stations.
- **Transfers from** Bus: Represents passenger trips originating on the MARTA Bus system and connecting to MARTA Rail at the drop-off points located at the rail stations.
- **Rail-to-Rail Transfers:** Represents passenger connections between the North/South line and the East/West line at Five Points Rail Station.
- **Total Rail UL Trips:** Represents the sum of the preceding three columns.
- **GFI Bus UL Trips:** Represents passenger boardings on MARTA Bus, as tallied by the farebox located on each vehicle. (GFI is an acronym for General Farebox Incorporated.)
- **Total UL Trips:** Represents the sum of the preceding two columns, a preliminary estimate of total daily unlinked passenger trips from data presently available.

TABLE 2-3. MARTA Fixed-Route Unlinked[1] Daily Passenger Trips During Olympic Games[2]

Olympic Day	Date	Rail Faregate UL Trips	Transfers from Bus	Rail-to-Rail Transfers	Total Rail UL Trips	GFI Bus UL Trips	Total UL Trips
Friday	7/19/96	473,927	66,669	149,994	690,590	324,000	1,014,590
Saturday	7/20/96	638,565	43,979	189,914	872,458	189,950	1,062,408
Sunday	7/21/96	509,825	31,595	150,690	692,110	110,200	802,310
Monday	7/22/96	622,433	68,666	191,973	883,072	348,000	1,231,072
Tuesday	7/23/96	596,457	66,885	184,250	847,592	348,000	1,195,592
Wednesday	7/24/96	665,349	68,725	203,967	938,041	348,000	1,286,041
Thursday	7/25/96	671,747	67,736	205,489	944,972	348,000	1,292,972
Friday	7/26/96	794,094	66,695	239,360	1,100,149	348,000	1,448,149
Saturday	7/27/96	694,648	39,171	204,288	938,107	189,950	1,128,057
Sunday	7/28/96	641,089	29,653	186,810	857,552	110,200	967,752
Monday	7/29/96	652,805	64,215	199,267	916,287	348,000	1,264,287
Tuesday	7/30/96	694,456	64,851	211,061	970,368	348,000	1,318,368
Wednesday	7/31/96	702,024	66,426	213,592	982,042	348,000	1,330,042
Thursday	8/1/96	772,222	64,617	232,703	1,069,542	348,000	1,417,542
Friday	8/2/96	854,628	68,320	256,687	1,179,635	348,000	1,527,635
Saturday	8/3/96	636,784	41,608	188,786	867,178	189,950	1,057,128
Sunday	8/4/96	459,231	27,529	135,489	622,249	110,200	732,449
Average Day (Olympic Games)		**651,781**	**55,726**	**196,725**	**904,232**	**276,732**	**1,180,964**
Average Weekday (Olympic Games)		**681,831**	**66,709**	**208,031**	**956,572**	**345,818**	**1,302,390**
Average Weekday (April 1995)					**230,000**	**252,000**	**482,000**
Percent change-------------------------------->					316%	37%	170%
Average Weekend (Olympic Games)		**596,690**	**35,589**	**175,996**	**808,276**	**150,075**	**958,351**
Average Weekend (April 1995)					**229,092**	**239,908**	**469,000**
Percent change-------------------------------->					253%	-37%	104%

Source: MARTA

NOTES:
1. An unlinked (UL) passenger trip is a one-way trip on a single mode of transit.
2. Data as of January 1997.

Based on the data in Table 2-3, MARTA fixed-route service overall (weekdays and weekend days combined) averaged approximately 1.2 million unlinked passenger trips per day during the Olympic Games: 0.9 million rail trips and 0.3 million bus trips. The average for Olympic weekdays only was 1.0 million unlinked rail trips and 0.3 million unlinked bus trips, for a total of 1.3 million unlinked passenger trips.

These figures varied significantly from MARTA's normal average weekday ridership figures. Compared to April 1995, average weekday ridership during the Olympic Games on MARTA Rail increased by 316 percent, or approximately four times the ridership observed in April 1995. However, these MARTA Rail trips only represented riders actually counted. It is known that many riders used MARTA Rail without being counted at the faregate, since ticketholders were allowed to pass through the opened handicapped entrance gates during heavy demand periods.

Compared to April 1995, average weekday ridership on MARTA Bus during the Olympic Games increased by 37 percent. Again, however, some Olympic ticketholders used the bus system without using the fare box and were not counted by the system adopted for data collection.

2.6.2.2 Olympic Games Spectator Shuttle Bus System

Table 2-4 presents unlinked passenger trips for the Olympic Games spectator shuttle **bus** system at Park & Ride lots and venues/rail stations:

- **Park & Ride UL Trips:** Represents the number of passengers that boarded the Olympic Games spectator shuttle bus system at Park & Ride lots, for trips to the venues or rail stations.
- **Venue UL Trips:** Represents the number of passengers that boarded the Olympic Games spectator shuttle bus system at a venue or rail station, for trips to the Park & Ride lots.
- **Total UL Trips:** Represents the sum of unlinked trips for the preceding two columns.

Ridership figures illustrated in Table 2-4 indicate that the Olympic Games spectator shuttle bus system experienced approximately 0.3 million average daily **unlinked** passenger trips during the Olympic Games. An average weekday experienced approximately 0.3 million unlinked passengers, as did the average

TABLE 2-4. Unlinked[1] Passenger Trips for the Olympic Spectator Shuttle Bus Service[2]

Olympic Day	Date	Park & Ride UL Trips	Venue/Stat. UL Trips	Total UL Trips
Friday	7/19/96	—[3]	20,394	20,394
Saturday	7/20/96	65,612	155,508	221,120
Sunday	7/21/96	70,236	231,023	301,259
Monday	7/22/96	75,762	172,828	248,590
Tuesday	7/23/96	87,652	193,506	281,158
Wednesday	7/24/96	76,585	215,593	292,178
Thursday	7/25/96	91,475	178,569	270,044
Friday	7/26/96	98,778	270,101	368,879
Saturday	7/27/96	111,592	291,185	402,777
Sunday	7/28/96	108,140	291,770	399,910
Monday	7/29/96	104,375	334,969	439,344
Tuesday	7/30/96	95,381	242,467	337,848
Wednesday	7/31/96	102,909	329,769	432,678
Thursday	8/1/96	112,383	291,622	404,005
Friday	8/2/96	81,667	347,794	429,461
Saturday	8/3/96	89,014	152,521	241,535
Sunday	8/4/96	56,679	172,938	229,617
Average Day (Olympic Games)		**89,265**	**228,974**	**312,988**
Average Weekday (Olympic Games)		**92,697**	**236,147**	**320,416**
Average Weekend (Olympic Games)		**83,545**	**215,824**	**299,370**

Source: MARTA

NOTES:
1. An unlinked passenter trip is a one-way trip on a single mode of transit.
2. Data as of January 1997.
3. "—" indicates service not operational.

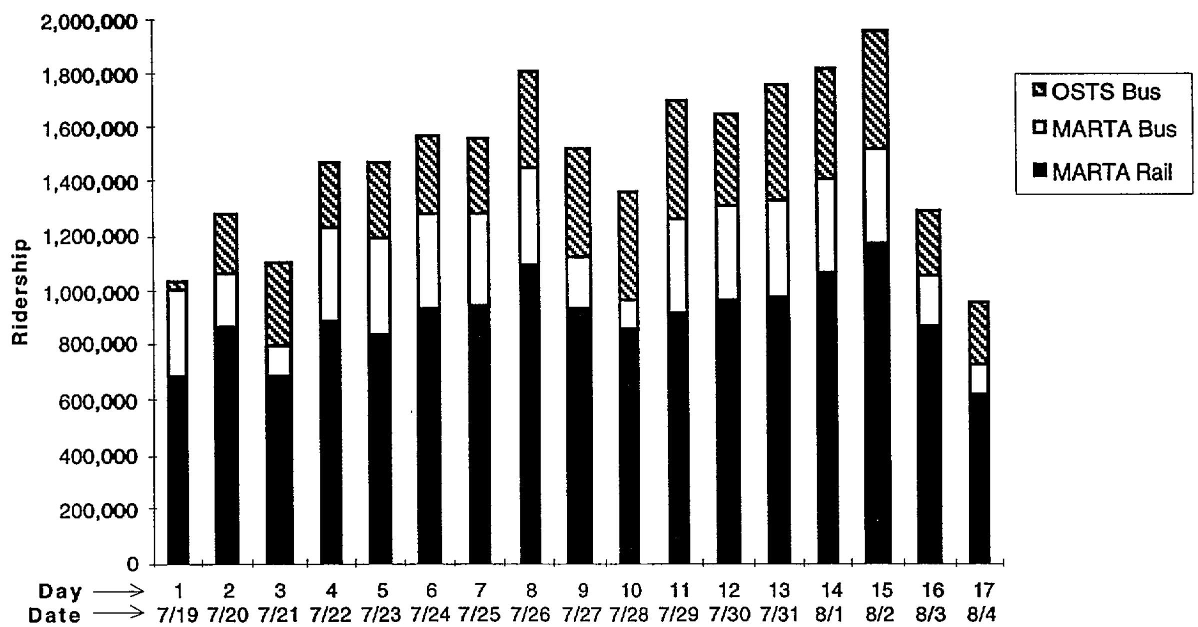


FIGURE 2-12. Olympic Games Ridership by Day and Type of Service

2.6.3 Comments

The implications of these travel demand statistics on the findings of the Event Study are important. The analysis of system performance, be it highway or transit, interagency cooperation, and agency or user perceptions must take into account that:

- MARTA Rail average weekday ridership was measured at more than four times higher than normal, and five times higher than normal on the busiest days.
- Ridership on the OSTS shuttle bus system was similar to MARTA Bus on weekdays and more than double MARTA Bus on weekends during the Olympic Games.
- The daily freeway travel demands were similar to normal, but the time distribution and vehicle mix were changed, probably due to TDM implementation before and during the Olympic Games.

2.7 DAILY REPORTS

During the Olympic and Paralympic Games, USDOT established an Information Resource Center (IRC) at FHWA, Georgia Division Offices. One of the major functions of the IRC was to produce a daily report for individuals within USDOT, regarding transportation operations for the previous day. Part of the IRC's daily report was based on a BA&H daily report, which reflected the major transportation occurrences observed by BA&H in the course of data collection activities. The BA&H report included information regarding:

- Freeway and TMC operations.
- Transit system operations.
- TCC operations.
- Special actions.
- Additional comments.

The BA&H daily reports are included in this Final Report as Appendix A.

TABLE 3-l. Objectives Developed for the Event Study

Assessment Area	Objectives
Transportation System Impacts	• Document the effectiveness of incident management. • Document the effectiveness of the TMC Incident Management System (IMS) software. • Document the effectiveness of the traffic surveillance components. • Document the effectiveness of the transit surveillance components. • Evaluate the utility of the ATIS components. • Evaluate the utility of the APTS components. • Evaluate the impact of the express (HOV) facilities. • Evaluate the impact of the North Line Rail Extension. • Document the performance of the freight movement plans developed for the Olympic Games period.
Institutional Impacts	• Document interagency operational coordination.
Agency and User Perceptions	. Document operator and supervisory perceptions of system performance. • Document the effectiveness of the Olympic Travel Demand Management Plans. • Document the ACOG Venue Transportation Managers' perceptions of the Olympic Travel Demand Management Plan-Venue Notebooks. • Document the perceptions of system performance from the agencies involved. • Assess the perceptions of the traveling public regarding their transportation experiences during the Olympic and Paralympic Games. • Assess the impact of the transportation system public relations plan. • Monitor perceptions of the transportation system performance as reported in the **media.**
Transferability	• Document the extent of unplanned modifications to the Transportation Management Plans during the Olympic Games. • Document the extent of unplanned modifications to the Transportation Management Plans for the Paralympic Games. • Assess the transferability of key lessons learned to other locations/major events.

Source: Event Study Data Management Plan, BA&H

3.1.3 Data Management Plan

The Event Study Data Management Plan formed the basis for subsequent data collection, processing, **and** analysis. For each of **the** objectives and sub-objectives, the following were specified:

- **Measures of effectiveness and performance:** Quantifiable parameters that validated the intended impact or influence, or characterized the physical activities required, of a system under observation.
- **Data elements:** Items measured or documented, to arrive at values for the measures of effectiveness and performance.
- **Data sources:** Locations in which the data elements were to be observed or obtained.

3.0 FINDINGS

This section presents the methodology adopted for the Event Study, describes the structure in which the findings are presented, and summarizes the findings from the data collection.

3.1 METHODOLOGY

The methodology adopted for the Event Study was divided into four stages:

- Defining assessment areas.
- Defining objectives and subobjectives.
- Preparing a data management plan.
- Collecting, processing, and analyzing data.

3.1.1 Assessment Areas

The Event Study focused on four specific assessment areas:

- **Transportation System Impacts:** Assessment **of** the performance and impact of the Atlanta deployments.
- **Institutional Impacts:** Assessment of interagency operational coordination during the games.
- **Agency and User Perceptions:** Assessment of how agencies, operators, supervisors, **and travelers** perceived the performance of the Atlanta deployments in particular, and transportation operations in general, during the event period.
- **Transferability:** Assessment of how the Atlanta transportation experience can be used elsewhere for other special events and at other locations.

3.1.2 Objectives and Subobjectives

Following the definition of the four assessment areas, objectives were developed for each, as shown in Table 3-1. Many of these objectives were further defined in the form of subobjectives, details of which can be found in the Data Management Plan, which is desa-ibed in the next section of this report.

TABLE 3-1. Objectives Developed for the Event Study

Assessment Area	Objectives
Transportation System Impacts	• Document the effectiveness of incident management. • Document the effectiveness of the TMC Incident Management System (IMS) software. • Document the effectiveness of the traffic surveillance components. • Document the effectiveness of the transit surveillance components. • Evaluate the utility of the ATIS components. • Evaluate the utility of the APTS components. • Evaluate the impact of the express (HOV) facilities. • Evaluation the impact of the North Line Rail Extension. • Document the performance of the freight movement plans development for the Olympic Games period
Institutional Impacts	• Document interagency operational coordination
Agency and User Perceptions	• Document operator and supervisory perceptions of system performance • Document the effectiveness of the Olympic Travel Demand Management Plans. • Document the ACOG Venue Transportation Managers' perceptions of the Olympic Travel Demand Management Plan--Venue Notebooks. • Document the perceptions of system performance from the agencies involved. • Assess the perceptions of the traveling public regarding their transportation experiences during the Olympic and Paralympic Games. • Assess the impact of the transportation system public relations plan. • Monitor perceptions of the transportation system performance as reported in the media.
Transferability	• Document the extent of unplanned modifications to the Transportation Management Plans during the Olympic Games. • Document the extent of unplanned modifications to the Transportation Management Plans for the Paralympic Games. • Assess the transferability of key lessons learned to other locations/major events.

Source: Event Study Data Management Plan, BA&H

3.1.3 Data Management Plan

The Event Study Data Management Plan formed the basis for subsequent data collection, processing, and analysis. For each of the objectives and sub-objectives, the following were specified:

- **Measures of effectiveness and performance:** Quantifiable parameters that validated the intended impact or influence, or characterized the physical activities required, of a system under observation

- **Data elements:** Items measured or documented, to arrive at values for the measures of effectiveness and performance.

- **Data sources:** Locations in which the data elements were to be observed or obtained.

- **Sample sizes: Quantity** of the data element required, based on statistical needs and availability.
- **Methods of data collection:** Observations, interviews, and reviews of control center logs.
- **Assessment methodology:** Approaches such as trend analysis, comparison, and documentation, for calculating or synthesizing system effectiveness or performance.

3.1.4 Data Collection, Processing, and Analysis

Figure 3-l illustrates the components of the Event Study data collectionprocess. The data collection involved observations at the GDOT TMC, MARTA TLC, the Atlanta TCC, and the TCCs at Clayton County, Cobb County, De Kalb County, Fulton County, and Gwinnett County. Other data sources included:

- Interviews with members of the public, businesses, and agency staff.
- A post-games workshop that included representatives of most agencies involved in transportation operations during the games.

Throughout the data collection period, control center (TMC, TLC, TCCs) staff were very cooperative with BA&H observers. Two specific exceptions were encountered:

- Because of security sensitivities during the Olympic Games, observations of HOV lanes were aborted. In spite of letters of authorization from SOLEC, BA&H observers were prevented from collecting HOV usage data by police patrols on the freeways.
- BA&H observers were not granted authorization to be located in ATOC during the games, and no data were collected. A senior APD officer who was present at ATOC throughout the event period was interviewed after the games.

As evidenced in the data management plan, difficulties were anticipated in obtaining data elements from only one source, hence each data element had more than one source. This approach greatly alleviated potential difficulties as several sources fell through during the games period, for exogenous reasons.

Although an extensive data collection program was put into effect, the assessment areas did not generally lend themselves to rigorous quantitative analysis. The intention of the Event Study was therefore to report its findings in a high-level, qualitative manner. Consequently, all findings presented in this Final Report should be treated only as indicative.

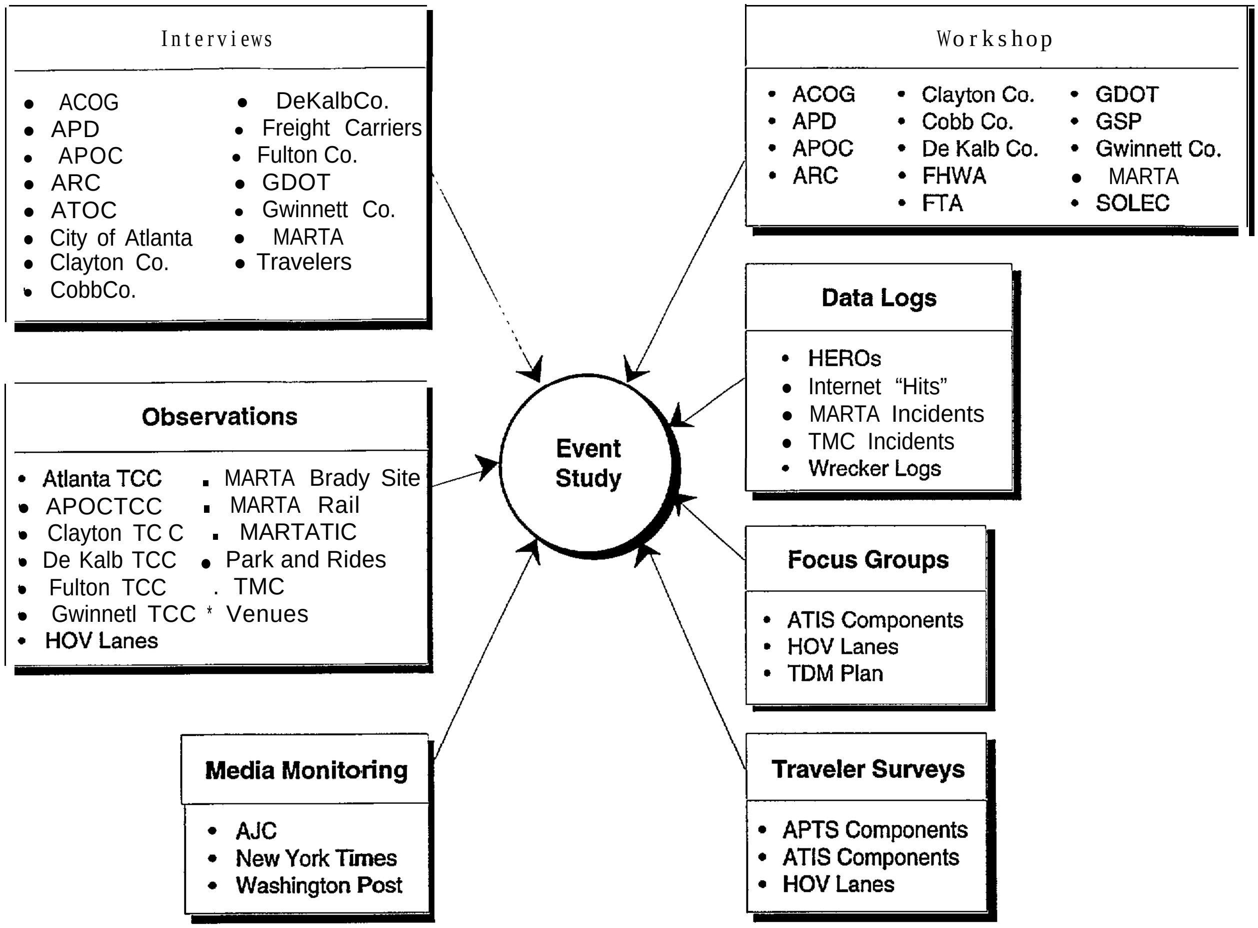


FIGURE 3-1. Event Study Data Collection

3.2 RESULTS PRESENTATION AND INTERPRETATION

3.2.1 Structure

The remainder of this section and the whole of Section 4.0, Conclusions, are devoted to the presentation and interpretation of the results of the Event Study. The general approach is shown in Figure 3-2. The volume of information involved required the development of a highly structured approach.

Findings are presented in this section under each of the four assessment areas. The findings are a factual summary of what was observed for each of the objectives listed in Table 3-l. For the benefit of readers who wish to browse through the main findings only, without reading all of Section 3.0, summary boxes contain the findings under each objective (or subobjective). In this section, findings are presented without interpretation.

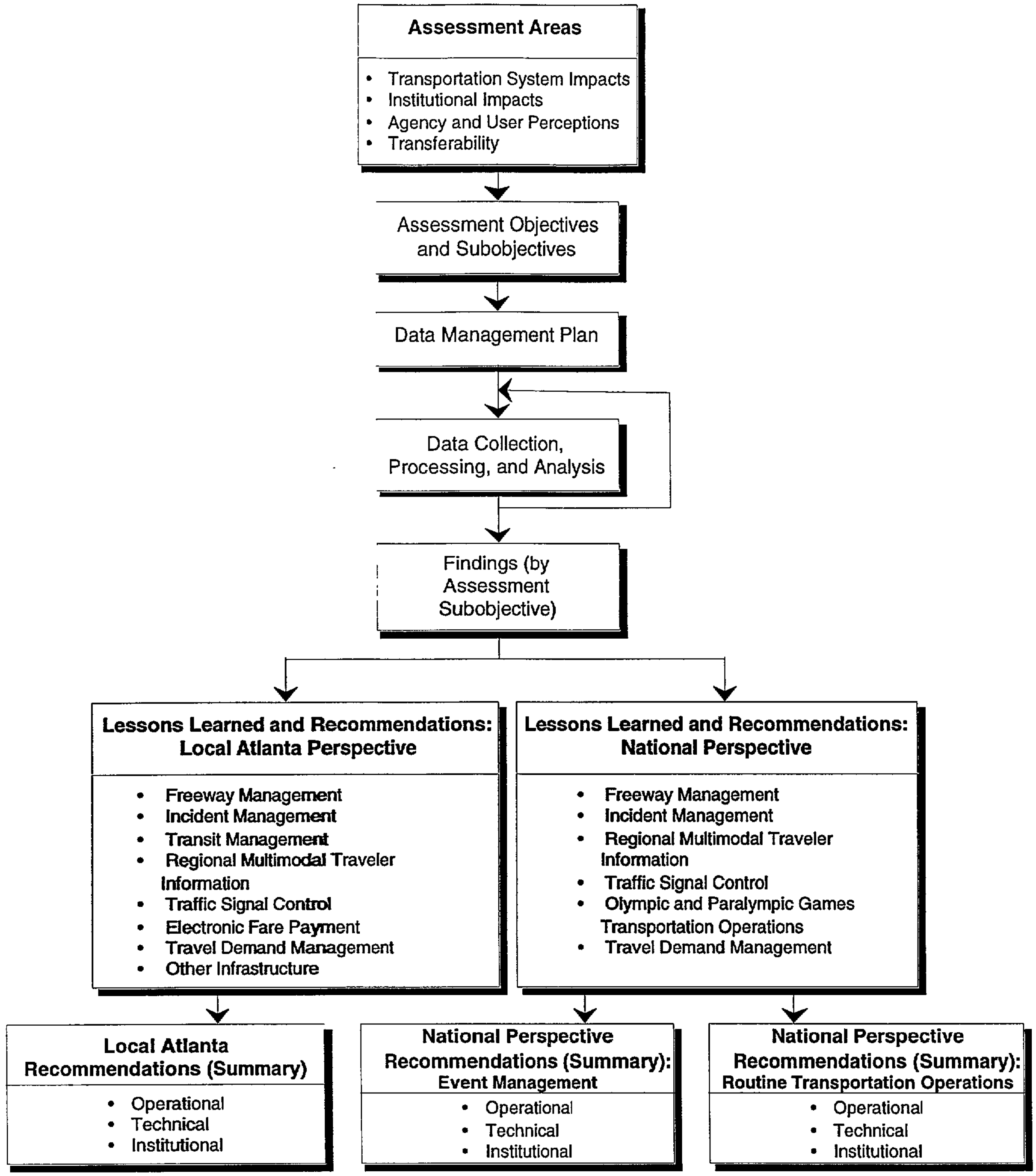


FIGURE 3-2. Assessment Approach

Lessons learned and corresponding recommendations are presented in Section 4.0. Lessons learned represent BA&H's interpretation of the findings. Relevant findings in the Section 3.0 summary boxes are presented again in Section 4.0 as "Supporting Findings" for each lesson learned. To focus on the requirements of both the Atlanta and national audiences, lessons learned and recommendations are presented in line with the nine Intelligent Transportation Infrastructure (ITI) groupings, only six of which apply to this study. The six IT1 groupings most relevant to the Event Study are:

- Freeway Management.
- Incident Management.
- Transit Management.
- Regional Multimodal Traveler Information.
- Traffic Signal Control.
- Electronic Fare Payment.

Three supplementary groupings have been added, to reflect the inclusion of non-ITI components within the scope of the Event Study:

- Olympic and Paralympic Games Transportation Operations.
- Travel Demand Management.
- Other Infrastructure.

Relevant ITI and non-ITI groupings are listed under each objective in Section 3.0. Lessons learned and recommendations are summarized in Section 4.0 under three functional groupings:

- Technical.
- Institutional.
- Operational.

3.2.2 IT1 Groupings

3.2.2.1 Freeway Management

Proactive freeway management is made possible by real-time knowledge of traffic and roadway conditions. This information is an important input for incident management and traveler information systems.

In Atlanta, the primary traffic surveillance technologies operational during the games were CCTV cameras (including the cameras intended to be used for video imaging) and radar speed detectors. Patrols by GDOT HEROs, Metro Network spotters, and other agency personnel were additional sources of traffic information. Cellular phone calls to GDOT, using the *DOT network, also provided traffic information directly from motorists. In addition to the interface with incident management and regional traveler information (described in the following sections), GDOT's TMC routinely monitored traffic flow and posted messages via CMSs to advise motorists of freeway conditions.

3.2.2.2 Incident Management

Rapid and effective incident response can reduce travel delay and even save lives. Real-time input from freeway and arterial surveillance systems is essential for incident detection and verification. Interagency cooperation is important for incident response, clearance, at-scene management, traffic control, and traveler information dissemination. In Atlanta, GDOT's TMC serves as the focal point for freeway incident management. An important feature of the TMC is a digital regional map that allows operators to display incident locations, assisting in the incident management process.

3.2.2.3 Transit Management

The four primary roles of ITS technologies in transit management are:

- Provide pretrip planning information.
- Provide real-time accurate information to travelers.
- **Monitor** and optimize transit fleet operations.
- **Automate maintenance** monitoring.

In Atlanta, automatic vehicle location (AVL), APC, and in-vehicle announcements **were deployed on selected MARTA** Buses. **Automated itinerary~planning was** also provided by the MARTA Customer Services department. Automated train control **(ATC) was deployed** on MARTA Rail (discussed under Other Infrastructure). While management, systems, operation, and maintenance of the OTS is the subject of a separate BA&H review for FTA, the Event Study addresses some of the key lessons learned from OTS operations.

3.2.2.4 Regional Multimodal Traveler Information

The provision of timely, integrated traffic and transit information facilitates informed transportation choices for a diverse range of users. Travelers may use such information for their personal needs, agencies may use it to support operational needs, and transportation-intensive private sector businesses may derive commercial benefit from such information. In Atlanta, regional multimodal traveler information was primarily provided as part of the Atlanta TIS, which had an interface with GDOT's TMC. Traveler information was also available via kiosks under FHWA's Atlanta Kiosk FOT, GDOT's *DOT call-in service, and MARTA's automated itinerary planning system.

3.2.2.5 Traffic Signal Control

Signaling systems that can react to changing traffic conditions are an important component in improving transportation system efficiency. This requires real-time inputs from traffic sensors. Advanced signal systems can automate this process throughout a network, and can include priority for emergency or transit vehicles. Ultimately, the electronic exchange of traffic data across jurisdictional boundaries will enable metropolitan area-wide signal coordination, facilitating improved arterial traffic flows, and freeway diversions during incidents.

In Atlanta, the primary focus was on upgrading traffic signals in the city of Atlanta and key locations in the five surrounding counties, enabling the ability to develop and implement a wide range of signal timing plans through a joint effort between GDOT and the city of Atlanta.

3.2.2.6 Electronic Fare Payment

Electronic fare payment offers convenience to the traveler and a combination of cost savings and information management to transit agencies. By eliminating the need for transit riders to carry exact change and by ultimately serving as a single-payment medium for a wide range of transportation services, electronic fare payment makes transit services easier to use. For transit agencies, this reduces cash-handling costs and provides almost real-time information about travel patterns **and** travelers.

In Atlanta, Nations Bank, First Union Bank, and Wachovia/VISA launched their smartcard to coincide with the games, entitling cardholders to ride MARTA and to use the card for payment at a variety of local outlets. The smartcards had a stored cash value, which was decremented each time the card was used.

3.2.2.7 Remaining ITI Gropewise

The remaining three ITI groupings, Electronic Toll Payment, Railroad Grade Crossings, and Emergency Management Services, were not addressed by any of the Atlanta ITS deployments.

3.2.3 Non-IT1 Groupings

Three supplementary groupings were added to the scope of the Event Study to reflect the inclusion of non-ITI components:

- Olympic and Paralympic Games Transportation Operations.
- Travel Demand Management.
- Other Infrastructure.

3.2.3.1 <u>Olympic and Paralympic Games Transportation Operations</u>

This grouping covers a range of issues and lessons learned pertaining to transportation operations during the games, including: transit management, city street operations, and security impacts.

3.2.3.2 <u>Travel Demand Management</u>

This grouping covers: lessons learned pertaining to the development of travel demand forecasts, and corresponding TDM plans implemented to mitigate congestion during the games period.

3.2.3.3 <u>Other Infrastructure</u>

This grouping covers lessons learned pertaining to the HOV lanes and the North Line Extension operations during the games period.

3.3 TRANSPORTATION SYSTEM IMPACTS

The Olympic Games provided an opportunity to evaluate the various transportation system components under an intense operating environment with very heavy travel demands. The transportation system components were also monitored during the Paralympic Games.

The ITI groupings covered were:

- Freeway Management.
- Incident Management.
- Transit Management.

The non-ITI grouping covered was:

- Olympic and Paralympic Games Transportation Operations.

3.3.1 Effectiveness of Incident Management

During the Olympic and Paralympic Games, BA&H collected information on the management of 152 sample incidents, as observed at the GDOT TMC. Lack of ATMS functionality prevented the collection of corresponding information at the TCCs, and at the MARTA TIC (see Table l-l). However, a review of OSTS incident management was undertaken, based on data obtained from the MARTA TIC.

The **152** sample incidents observed at the TMC were selected on a "first-come first-served basis." Where incidents occurred simultaneously, preference was given to the more serious incidents, if it was not possible to observe all incidents. The incidents observed covered a range of levels and types, as shown in Table 3-2, with the majority being accidents.

TABLE 3-2. Sample Observed Incidents by Level and Type

Level	Accident	Stall	Debris	Other	Total
I	28	11	1	2	42
II	42	23	1	1	67
III	30	3	1	2	36
IV	6	1	0	0	7
Total	106	38	3	5	152

Source: BA&H observafions at the GDOT TMC during the Olympic and Paralympic Games

The incident level is based on the severity of the incident. Incidents are divided into four levels, with level 1 being the least severe and level 4 being the most severe. Definitions and examples of the different levels of incidents are listed below:

- **Level 1 Incident:** An incident or accident with no injuries and no lanes blocked.

  Examples:
  1. Disabled vehicle on shoulder.
  2. Minor fender bender; vehicles moved to shoulder.
  3. **Debris** not affecting normal traffic flow.

- **Level 2 Incident:** An incident **or** accident with minor injuries and/or one lane blocked.

  Examples:
  1. Stalled vehicle in any lane.
  2. Accident blocking any one lane, with or without injuries.
  3. Debris blocking one lane.
  4. Oil spill affecting one lane.

- **Level 3 Incident:** An incident or accident, with or without serious injuries, that blocks two or more lanes, but does not completely shut down the freeway or interstate.

  Examples:
  1. Accident blocking two or more lanes.
  2. Serious injuries, with or without fatalities.
  3. Debris or oil spill affecting two or more lanes.
  4. HAZMAT spill not completely blocking the freeway or interstate.

- Level 4 Incident: Any incident or accident completely blocking the freeway or interstate for two or more hours; further defined as ANY MAJOR ACCIDENT or incident.

  Examples:
  1. Major HAZMAT spill.
  2. Overturned fuel truck.
  3. Fallen power line on freeway or interstate.
  4. Accidents with more than two fatalities.
  5. Incidents involving major damage to highway infrastructure.
  6. Any incident that, because of its abnormal severity, could fall into this category.

These level descriptions are not restricted. In certain incidents, the level of an incident may be determined based on time of day, location of incident, or some other factor.

As the incident level increases, the TMCs incident management procedure necessitates more widespread response actions, e.g., the progressive involvement of senior management.

TMC operators follow a number of steps when managing incidents:

1. At some stage shortly after an incident has occurred, a report is received at the TMC. Depending on the source of the report, the first step is to verify the incident details. During the time between first report and verification, the incident is deemed a "potential incident." GDOT sets rigorous guidelines regarding the criteria that must be satisfied before an incident is deemed to be verified. However, potential incidents are allocated an incident reference number, which is used for subsequent tracking purposes.
2. Once an incident has been verified, an incident is "declared" by the TMC, and key minimum details are entered into the TMC's incident database. Typical details include incident: type, location, lanes blocked, and severity. These are entered into the Incident Logger System using an electronic Incident Tracking Form. These details will ensure that the appropriate incident management responses are subsequently made. (In many cases, these key minimum details are entered before the incident has been verified.) This is an important step in the TMC incident management process. The time taken between verification and incident declaration is entirely under the TMC's control.
3. Any incident that affects a travel lane (level 2 and higher) may require some form of traffic management response, e.g., posting CMS messages. Such responses are a direct function of the key minimum details, such as location and incident level. When a level 2 or more severe incident is declared, the TMC operator must place an icon (a computer-generated symbol) at the location of the incident on the GIS map of the road network. The Incident Management System (IMS) automatically generates a response plan once the icon has been placed. The icon must be

accurately placed at the incident location on the map, to ensure that an appropriate response plan is generated.

4. As the incident level changes during the life of an incident, the IMS generates revised incident management responses. Ultimately, termination of the incident in the IMS results in deletion of the icon and the termination of associated incident management responses.

The total number of incidents that occurred during the games is not known. The IMS database includes archived information on potential and confirmed incidents from July 17th (Day 1) through the early hours of July 26 (Day 8) only. Data relating to the remainder of the Olympic Games and the Paralympic Games does not exist. The TMC IMS database does not have these data; the reason for this is unknown.

Using information from the TMS database for the period July 20 (Day 2) through July 25 (Day 7), the sampling rates of the BA&H observations have been calculated and are shown in Table 3-3. No data were collected on Day 1, as the only events that took place that day were the conclusion of the torch relay and the Opening Ceremony.

Table 3-3 indicates the sampling rates for the period July 20 through July 25, for each level **and** incident type. The first figure is the number of BA&H observations of sample incidents **during** this 6-day period; the second figure is the corresponding nurnber of IMS database incidents. Both the BA&H observations and the IMS database included incidents **on** and off the freeway, although BA&H observations focused on freeway incidents_ The IMS database also included incidents throughout the State of Georgia, while **BA&H** observations were concentrated around the Atlanta metropolitan region. The IMS database covered incidents during a full 24-h period each day, while the **BA&H observations** typically covered an 8- to 16-h period.

TABLE 3-3. Sampling Rates of BA&H Observations July 20 to July 25,1996

Level	Accident	Stall	Debris	Other	Total
1	7/39	8/42	0/6	1/4	16/91 (18%)
2	9/40	6/35	1/9	0/4	16/88 (18%)
3	12/26	2/3	1/4	0/2	15/35 (43%)
4	1/9	0/0	0/0	0/1	1/10 (10%)
Total	29/114 (25%)	16/80 (20%)	2/19 (11%)	1/11 (9%)	48/224 (21%)

Source: BA&H observafions at fhe GDOT TMC during the Olympic and Paralympic Games

Three levels of quality checks were made when comparing BA&H observations with the IMS database:

- All incidents observed by BA&H were checked for inclusion in the IMS database.
- All incident numbers in the IMS database were checked to be sequential; it was noted that three incident numbers were unused, and some incidents had duplicate incident numbers.
- No periods of undue length with missing data were found.

Inspection of the IMS database revealed that, in addition to the 224 incidents that occurred during the period, a further 186 incidents were also reported. These fell into one of the following categories:

- Potential incidents that were not confirmed (128 incidents).
- Confirmed incidents for which insufficient information was available to assign a level (58 incidents).

BA&H observers did not collect any information about these 186 reported incidents.

As seen in Table 3-3, BA&H observations represented 21 percent of the total incidents tracked by TMC during the period. Coverage varied by level, with approximately 18 percent of level 1 and 2 incidents sampled, 43 percent of level 3 incidents sampled, and 10 percent of level 4 incidents sampled. The lower sampling rate for level 4 incidents is accounted for by the fact that seven incidents were outside the metropolitan area, one incident occurred late at night when BA&H observers were not present in the TMC, and one incident was first observed by BA&H after it had been downgraded to level 3.

In the absence of archived IMS database information on potential and confirmed incidents for the period following July 26 (Day 5), sampling rates could not be calculated for the incidents monitored by BA&H. As the games progressed, BA&H observers paid less attention to observing level 1 incidents. The consequence was that the sampling rate for level 1 incidents declined. Level 1 incidents were generally stalled vehicles on the shoulder, which were routinely managed by TMC operators and GDOT HEROs, with little or no impact on other motorists. The decision to reduce BA&H observations was based on the fact that even at a lower sampling level, adequate data were obtained to assess the performance of incident management operations for level 1 incidents. It was assumed that the sampling rates for all other levels remained generally constant during the Olympic Games, but were reduced during the Paralympic Games because of less extensive BA&H presence.

3.3.1.1 Timeliness of Incident Verification

It is difficult to determine reliably the time taken to detect an incident. Unless incidents are staged, their time of occurrence cannot be accurately recorded. Even if the time an incident occurs is known, unless the time of occurrence and the time of detection are based on synchronized clocks, it is difficult to determine the time taken to detect the incident.

GDOT planned to use the video imaging detection system to monitor freeway speeds inside the I-285 Perimeter, and to use this information as input to an automatic incident detection algorithm. Although the video imaging cameras were installed and operational during the games, the video detection system was not. Real-time traffic flow data were therefore not available, ruling out the possibility of using any incident detection algorithms.

While this background is a matter for the Case Study, it is reasonable to assume that incident detection and verification performance will improve when the video imaging system is fully operational.

Verification of an incident, after an initial report has been received, is the first incident management element that lends itself to measurement. All incidents must be declared as part of the incident management process. Table 3-4 indicates that 87 percent of the observed incidents were verified in less than 5 min. Table 3-5 indicates that 95 percent of the observed incidents were declared in less than 5 min, and no incidents took 10 min or more to declare. (Note: The totals in Tables 3-4 and 3-5 and subsequent tables vary depending on data availability, but are drawn from the same sample presented in Table 3-2. The time intervals in Table 3-4 and subsequent tables were selected to reflect typical response ranges, from fast to slow. Percentages may not add up to 100, due to rounding.)

TABLE 3-4. Time Taken-First Report to Incident Verification

Period	<2 Min	2 to <5 Min	5 to <10 Min	10 or More Min	Mean Time (Min)	Max. Time (Min)
Olympic and Paralympic Games	72 (71%)	16 (16%)	5 (5%)	9 (9%)	2.5	35
Olympic Games (week 1)	27 (64%)	6 (14%)	2 (5%)	7 (17%)	4.2	35
Olympic Games (week 2)	31 (77%)	5 (12%)	2 (5%)	2 (5%)	1.3	15
Paralympic Games	7 (64%)	4 (36%)	0	0	1.1	3

Source: BA&H observations in the GDOT TMC during the Olympic and Paralympic Games

TABLE 3-5. Time Taken—Incident Verification to Incident Declared

Period	< 2 Min	2 to < 5 Min	5 to < 10 Min	10 or More Min	Mean Time (Min)	Max. Time (Min)
Olympic and Paralympic Games	99 (85%)	12 (10%)	5 (4%)	0	0.6	9
Olympic Games (week 1)	37 (79%)	6 (13%)	4 (9%)	0	1.0	9
Olympic Games (week 2)	45 (94%)	3 (6%)	0	0	0.2	3
Paralympic Games	9 (75%)	2 (17%)	1 (8%)	0	1.2	7

Source: BA&H observations in the GDOT TMC during the Olympic and Paralympic Games

To understand this performance better, a trend analysis was done by grouping the majority of observed incidents into one of three weekly periods:

- Saturday July 20 to Friday July 26 (Olympic Games, week 1).
- Saturday July 27 to Friday August 2 (Olympic Games, week 2).
- Saturday August 17 to Friday August 23 (Paralympic Games).

Findings are also shown in Tables 3-4 and 3-5. Comparing the first and second weeks of the Olympic Games, it is immediately apparent that incident verification and declaration performance both improved. The proportion of incidents taking less than 5 min to verify increased from 78 percent (64 percent plus 14 percent) to 89 percent (77 percent plus 12 percent) (Table 3-4). The proportion of incidents taking 10 or more min to verify reduced from 17 percent to 5 percent (Table 3-4). Similarly, the proportion of incidents taking less than 5 min to declare increased from 92 percent to 100 percent, with a majority taking less than 2 min (Table 3-5). This performance improvement is underlined by the noticeable reductions in the mean times, and the corresponding maximum times, for incident verification and declaration.

A comparison of the performance between the second week of the Olympic Games and the period of the Paralympic Games suggests a partial reversal in performance. While the proportion of incidents taking less than 5 min to verify increased from 89 percent to 100 percent, the proportion of incidents taking less than 2 min to verify reduced from 77 percent to 64 percent. The proportion of incidents taking less than 5 min to declare reduced from 100 percent to 92 percent, which was similar to the performance during the first week of the Olympic Games.

Incident verification performance continued to improve, with reductions in the mean and maximum times. Incident declaration showed increases in the mean and maximum times, similar to the performance levels during the first week of the Olympic Games. The reasons for these changes are not known, but they could be due to reductions in staffing levels of TMC operators following the Olympic Games. Also, the sample size during the Paralympic Games was approximately one-quarter that of each of the two weeks of the Olympic Games, making comparisons difficult.

Overall, the mean time to verify and declare an incident reduced from 5.2 min to **2.3** min between the first week of the Olympic Games and the Paralympic Games. Corresponding reductions were also observed in the maximum times. This represents a noticeable improvement during a short period of time in which staffing levels of TMC operators were reduced. These reductions offer the potential to manage incidents better during their early stages, reducing their consequential impact on other motorists.

In summary, the findings of the data analysis regarding incident management timeliness were as follows:

- A sustained improvement in mean and maximum times to verify an incident was observed.
- A reduction in the maximum time to declare an incident was observed.
- An increase in the mean time to declare an incident was observed, possibly due to reductions in staffing levels of TMC operators.
- An overall reduction in the mean time to verify and declare an incident, from **5.2** min to **2.3** min, was observed, offering the potential to manage incidents better during their early stages.
- The video-imaging-camera based incident detection algorithm was not operational during the games. It is reasonable to assume that incident detection and verification performance will improve further when the video imaging system is fully operational.

3.3.1.2 Appropriateness and Timeliness of Incident Responses

All incidents require some form of incident response. Depending on the incident location, the IMS may be able to generate an automatic response for incidents that affect one or more travel lanes (level 2 or higher). This requires that an icon be placed in the IMS GIS database map, to reflect the incident location accurately. Placing an icon is a necessary step toward generating an IMS response plan. The accurate and timely placement of icons is therefore a critical component in the management of incidents affecting travel lanes.

Table 3-6 indicates that in 39 percent of incidents, icon placement took less than 5 min after incident verification.

TABLE 3-6. Time Taken-Incident Verification to Icon Placement

Period	<2 Min	2 to <5 Min	5 to<10 Min	10 or More Min	Mean Time (Min)	Max. Time (Min)
Olympic and Paralympic Games	9 (11%)	23 (28%)	39 (47%)	12 (14%)	6.8	39
Olympic Games (week 1)	2 (6%)	5 (16%)	15 (47%)	1 (31%)	9.5	39
Olympic Games (week 2)	3 (8%)	1 (31%)	21 (58%)	1 (3%)	5.1	13
Paralympic Games	0	7 (70%)	3 (30%)	0	4.7	9

Source: BA&H observations in the GDOT TMC during the Olympic and Paralympic **Games**

To understand performance better, a trend analysis was done by grouping the majority of observed incidents into the same weekly periods used previously. The findings are shown in Table 3-6. It is immediately apparent that the performance for icon placing improved with each successive week. The proportion of incidents for which icon placement took less than 5 min after incident verification increased from 22 percent to 70 percent between the first week of the Olympic Games and the Paralympic Games. The proportion of incidents for which icon placement took 10 or more min reduced from 31 percent to 0 percent. This performance improvement was emphasized by the noticeable reductions in mean times, and the corresponding maximum times, for icon placement.

A comparison of performance between the second week of the Olympic Games and the Paralympic Games suggests a partial reversal in performance, with the proportion of incidents taking less than 2 min for icon placement reducing from 8 percent to 0 percent. This was worse than the performance during the first week of the Olympic Games. The reasons for this change are not known, but it again could be due to reductions in staffing levels of TMC operators following the Olympic Games. Also, the sample size during the Paralympic Games was slightly less than one-third that of each of the two weeks of the Olympic Games.

Overall, the mean time to place an icon after incident verification reduced from 9.5 min to 4.7 min between the first week of the Olympic Games and the period of the Paralympic Games. Corresponding reductions were observed in maximum times. When these times are combined with those for incident verification from the previous discussion, the mean time to verify an incident and place an icon reduced from 13.7 min to 5.8 min between the first week of the Olympic Games and the period of the Paralympic Games. This represents a noticeable improvement over a short period of time, during which staffing levels of TMC operators were reduced. Improving icon placement time offers the potential to manage higher level incidents better, reducing their resultant impact on other motorists.

Taking the difference between the mean times in Table 3-6 **and** those in Table 3-5 results in the mean time between incident declaration and icon placement. This is helpful, because it isolates the actual time spent on the process of icon placement, which was identified by operators as a difficult task. Once again, an improvement trend is apparent, from 8.5 min during the first week of the Olympic Games, to 4.9 min during the second week of the Olympic Games, to 3.5 min during the Paralympic Games. The week-by-week improvement appears to be slowing, perhaps suggesting that the process of icon placement is approaching the minimum time feasible within the limits of existing hardware/software configurations.

As stated, the action of placing an icon is critical to the management of level 2 and higher incidents. In placing an icon, operators must scan the database map and visually select the correct location. When zooming in or out, or moving from location to location, the operators' screens need to refresh for each movement, which is a memory consuming and slow process. No facility exists to select a street name or interchange number to avoid this visual scanning. We consider this process time-consuming, even for a skilled operator, and a review of possible performance enhancements by GDOT may be justified, if further reductions in the time for icon placement are desired.

In summary, the findings of the data analysis regarding the appropriateness and timeliness of incident responses were as follows:

- A sustained improvement was observed in mean and maximum times to place an icon after incident verification, despite reductions in staffing levels of TMC operators.
- An overall reduction was observed in the mean time to verify an incident and place an icon, from 13.7 mm to 5.8 min, offering the potential to manage better these incidents directly affecting travel lanes.
- The week-by-week improvement appeared to be slowing, perhaps suggesting that the process of icon placement is approaching the minimum feasible time within the limits of existing hardware/software configurations. The process for icon placement is time-consuming, even for a skilled operator, and a review of possible performance enhancements by GDOT may be justified if further reductions in the time for icon placement are desired.

3.3.1.3 Effectiveness of Incident Clearance Operations

Incident clearance time is dependent on many factors, including:

- Location of incident.
- Number and type of vehicles involved.
- Number and severity of injuries.
- Presence of hazardous materials.
- On-scene crew and equipment capabilities.

- Extent of interagency cooperation.
- Degree of preparedness of agencies involved.

The extent to which the TMC can influence incident clearance time is therefore limited by the circumstances of each individual incident. Likewise, any comparison of incident clearance times must take account the relative impacts of these factors. Table 3-7 indicates that, for 19 percent of incidents, traffic lanes were cleared in less than 10 mm after incident verification. However, 43 percent of incidents took 30 min or more to clear, resulting in a mean time slightly in excess of 35 min.

The incident that took the longest to clear was an accident on northbound I-85. The accident involved a truck carrying a mobile home and a tanker loaded with bulk cement. It took more than 6 h to clear and was probably the most significant freeway incident that occurred during the games, in terms of vehicle types involved, traffic disruption caused, and incident clearance resources required. This incident is discussed in greater detail in Section 3.3.1.5.

TABLE 3-7. Time Taken-Incident Verification to Clearance of Traffic Lanes

Period	< 10 Min	10 to <20 Min	20to <30 Min	30 or More Min	Mean Time (Min)	Max. Time (H-Min)
Olympic and Paralympic Games	19(17%)	22(20%)	22(20%)	48(43%)	35.4	6-15
Olympic Games (week 1)	4 (10%)	8(20%)	13 (32%)	16 (39%)	40.5	6-15
Olympic Games (week 2)	9(19%)	5(10%)	9 (19%)	25 (52%)	37.9	2-53
Paralympic Games	2(15%)	6(46%)	0	5 (38%)	24.9	1-28

Source: BA&H observations in the GDOT TMC during the Olympic and Paralympic Games

To understand performance better, a trend analysis was done by grouping the majority of observed incidents into the same weekly periods used earlier. The findings are shown in Table 3-7. It is immediately apparent that, based on reductions in mean times and the corresponding maximum times, incident clearance performance improved with each successive week. The mean time for incident clearance after incident verification reduced from 40.5 min to 24.9 min between the first week of the Olympic Games and the period of the Paralympic Games.

While these results are generally positive, it is apparent that there were fluctuations from week to week, reflecting the different characteristics of individual incidents, e.g., location and level. For example, no repetition of the I-85 mobile home/bulk cement tanker accident occurred after the first week of the Olympic Games. Such incidents are uncommon and can distort data analysis with outlying data points.

To understand better the relative performance of incident clearance at different locations around the metropolitan area, the freeways were divided into two geographic zones:

- Inside the perimeter.
- On and outside the perimeter.

For incidents located in both zones (Table 3-8), improvement patterns for mean and maximum clearance times are similar to those described previously. However incidents located on and outside the perimeter took longer to clear than those inside the perimeter. On average, this difference was 20 min during the games, varying from between 16 min in the first week of the Olympic Games to nearly 25 min in the following week. Despite the I-85 mobile home/bulk cement tanker accident, which occurred outside the perimeter in the first week of the Olympic Games, incident clearance time outside the perimeter worsened in the following week. This highlights the need to correlate incident clearance times with incident levels. Unfortunately, the sample sizes in this study were inadequate for such an analysis.

TABLE 3-8. Time Taken-Incident Verification to Clearance of Traffic Lanes, by Geographic Zone

Period	Inside Perimeter		Perimeter and Outside Perimeter	
	Mean Time (Min)	Max. Time (H-Min)	Mean Time (Min)	Max. Time (H-Min)
Olympic and Paralympic Games	28.8	I-59	48.9	6-1 5
Olympic Games (week 1)	34.2	I-59	50.4	6-15
Olympic Games (week 2)	27.1	1-17	51.7	2-53
Paralympic Games	16.4	o-35	34.8	1-28

Source: BA&H observations in the GDOT TMC during the Olympic and Paralympic Games

Although these results were achieved in spite of a 20 percent reduction in the operating hours of the GDOT HEROs, and reductions in staffing levels of TMC operators during the Paralympic Games, compared to the Olympic Games, no overall conclusions on incident clearance performance can be made at this time. A much longer period of data collection is required before any firm conclusions can be drawn. Adequate incident clearance time data are required for all incident levels in both geographic zones.

In summary, the findings of the data analysis regarding the effectiveness of incident clearance operations are as follows:

- An apparent improvement was observed in the mean time to clear incidents after incident verification, from 40.5 min to 24.9 min, despite reductions in the operating hours of GDOT HEROs and the staffing levels of TMC operators.
- For incidents located on and outside the perimeter, incidents took longer to clear than those inside the perimeter. On average, this difference was 20 min during the games.
- No overall conclusions on incident clearance performance can be made at this time. A much longer period of data collection is required before any firm conclusions can be drawn. Adequate incident clearance time data are required for all incident levels in both geographic zones.

Comments

The findings reported up to this point have all been based on BA&H observations in the TMC. In compiling these findings, we attempted to cross-reference with the IMS database, which contains only one time-related field: incident declaration time. Time of first report, time of verification, time of icon placement, and time traffic lanes cleared are not recorded in the IMS database. These times can be tracked if a text entry to the IMS database is made by an operator, e.g., "HERO arrives at scene." In these cases, the time is recorded by time-stamping the text entry. While this is valuable information to collect, it does not readily lend itself to analysis, for the following reasons:

- There is no operator obligation to record this information.
- All **text** fields would need to be searched to locate those incidents for which such information has been recorded. These notations would then be subject to special analysis and interpretation.

Thus, while the TMC is able to search the IMS database for such incident trends as numbers, locations, types, and levels, it is unable easily to perform a trend analysis of incident management.

3.3.1.4 Effectiveness of the GDOT HEROs and the MARTA/ACOG Tow Fleet in Responding to Incidents

GDOT HERO Role

Unlike most ITS deployments under study, GDOT HEROs had the benefit of a prolonged period of operational deployment before the games commenced. GDOT HEROs commenced practical training in the summer of 1995, well in advance of their inauguration on January 17,1996. The primary role of GDOT HEROs was to detect and respond to incidents bv:

- Patrolling a fixed route on the freeway system.
- Providing on-scene communications and serving as an agency coordination hub for incidents.
- Facilitating traffic control at incidents.
- Assisting stranded motorists in stalled vehicles.
- Pushing/towing stalled vehicles from travel lanes to the shoulder.
- Assisting other agencies and GDOT HEROs during major incidents.

GDOT HEROs can be requested by TMC operators to assist in incident response. They are dispatched by a GDOT post-certified police officer located in the GDOT TMC, who can authorize unattended vehicles to be towed. This officer handles all incoming calls from the GDOT HEROs and is also the coordinator for requesting wrecker services at incidents. (GDOT has agreements with wrecker companies to provide towing assistance during incidents.) During the Olympic Games, this included requesting wreckers for stalled buses, even though MARTA and ACOG had their own wrecker contracts. GDOT HERO services are provided at no charge to motorists, and GDOT HEROs do not **to** accept gratuities.

GDOT HERO Operations During the Games

During the Olympic Games, GDOT HEROs operated 20 h per day (24 h on Opening and Closing Ceremony days). During the Paralympic Games, GDOT HEROs operated 16 h per day (20 h on Opening and Closing Ceremony days). Throughout the games, six GDOT HEROs patrolled the freeways in the Atlanta metropolitan area (seven on Opening and Closing Ceremony days). Patrol routes are shown in Figure 3-3. Coverage was restricted by the limited availability of the drivers. GDOT's strategy was to maximize coverage along those freeways that were most critical to traffic operations during the Olympic Games.

During the 17-day period of the Olympic Games, GDOT HEROs drove an average of 2,200 miles per day-double their normal coverage. On average, GDOT HEROs assisted in 85 incidents per day during the Olympic Games, nearly 60 percent above normal levels. During the Paralympic Games, GDOT HEROs drove an average of 1,360 miles per day and assisted in 59 incidents per day. Assistance was given to 96 buses during the Olympic Games, but only 2 buses during the Paralympic Games. GDOT HEROs also assisted police during bomb scares and associated ramp closures in the downtown area during the games.

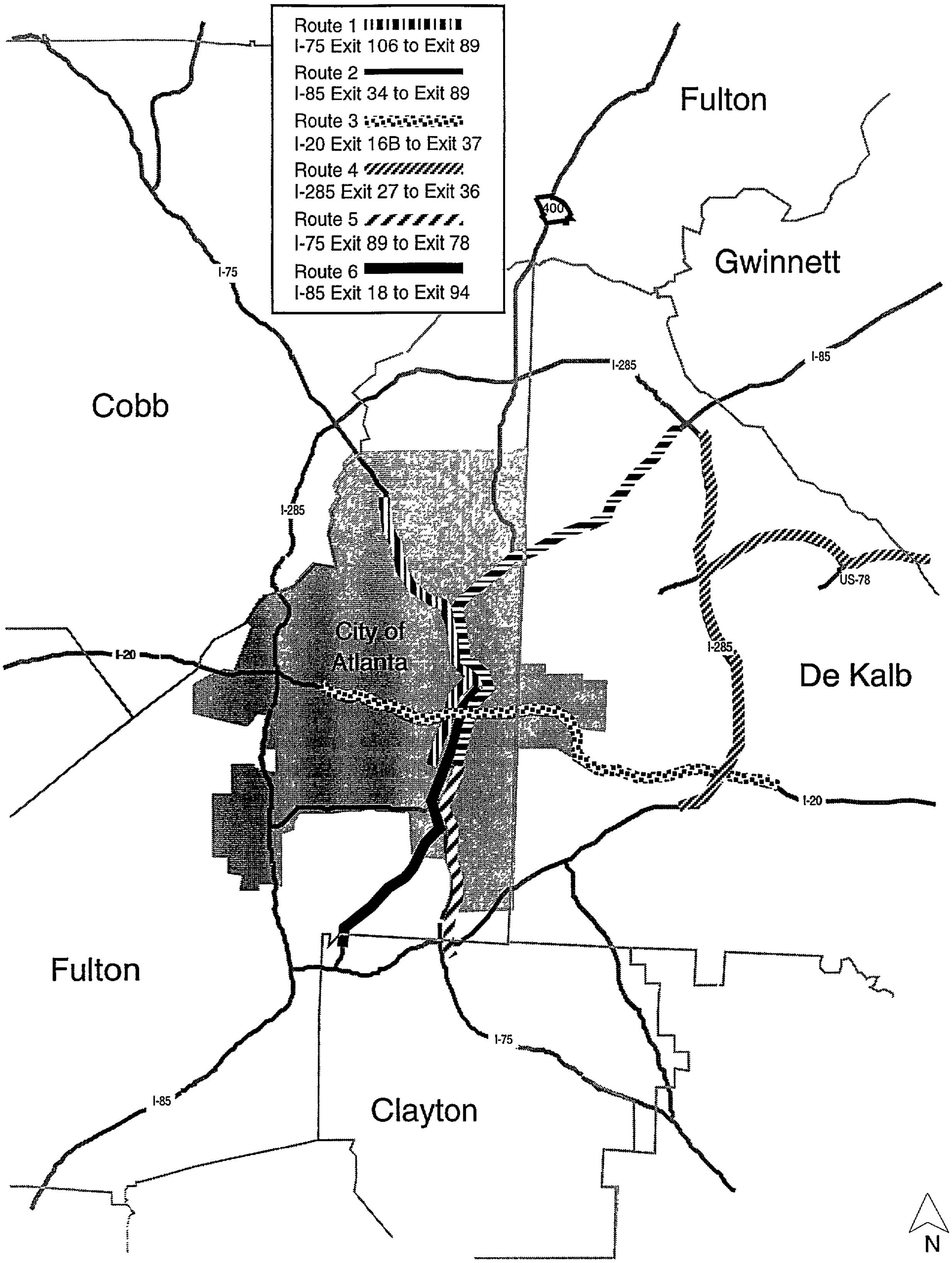


FIGURE 3-3. GDOT HERO Patrol Routes

During 87 percent of the incidents they responded to during the games, GDOT HEROs provided motorist assistance; the remainder were accidents. The most common forms of assistance provided were (in order):

- Tire change.
- Mechanical assistance.
- Traffic control.
- Provide cellular phone.
- Provide gasoline.
- Service battery.
- Service coolant.
- Remove debris.
- Push vehicle off road.
- Give directions.
- Provide transport.
- Provide oil.
- Provide first aid.
- Provide ride.

GDOT HEROs Impact

GDOT HEROs contributed to minimizing the impact of incidents on other motorists by providing assistance as directed by TMC operators. In the absence of GDOT HEROs, delays were inevitably longer, as assistance was required from alternative sources. The flexibility of GDOT HEROs to handle a variety of incident types was also important.

However, it is not possible to undertake any quantitative analysis of GDOT HEROs performance. While the HERO dispatch officer in the TMC maintains a database of all HERO operations, this is not linked to the IMS database and does not incorporate IMS-generated incident reference numbers. This prevents an assessment of the response and clearance times, which in turn is a significant barrier to monitoring performance of the GDOT HEROs and measuring their impact on incidents.

Based on the opinions of the motorists assisted and the agencies involved in incident management, the perception of GDOT HEROs was very positive. The HERO program is relatively new, and many motorists receiving assistance are experiencing it for the first time. GDOT HEROs have received several calls and mail-in's from motorists indicating their appreciation of the HEROs' quick response and assistance. We have not undertaken a detailed review of these responses, but they are indicative of public acceptance of the GDOT HEROs. Highway departments typically do not come in close contact with the motoring public-their customers; but the HEROs effectively serve as ambassadors for GDOT. The GDOT HERO vehicles also warrant particular mention; unlike similar services in other U.S. cities, the HERO fleet is new and always spotlessly clean.

During the games, a BA&H observer who traveled with a GDOT HERO for an entire shift made the following observations:

- GDOT HEROs are well received by motorists and law enforcement agencies. Motorists feel secure at the scene, and police officers entrust the management of several incidents solely to HEROs, freeing or releasing the officers for other tasks.
- GDOT HEROs are duty-bound and disciplined, allowing maximum efficiency to be achieved.
- The assistance provided by GDOT HEROs in closing freeway exits during bomb scare evacuations in downtown Atlanta was widely appreciated and well received by law enforcement agencies.

BA&H observers in the TMC noted that, on a number of occasions during the Olympic Games, lunch arrangements resulted in no GDOT HEROs available for up to 30 min during the middle of the shift, restricting incident management options for several incidents. It was noted that this arrangement only applied during the Olympic Games, and no major incidents were affected.

GDOT HEROs may occasionally find themselves in situations where they overlook safety risks, particularly during the early stages of incident management at the scene. Examples are: by reversing their vehicle in a travel lane, walking in or across a traffic lane, or the setting up suboptimal traffic management arrangements.

In summary, the findings of the data analysis regarding GDOT HEROs were as follows:

- The deployment of GDOT HEROs was focused to meet GDOT's strategy to maximize coverage along those freeways that were most critical to operations during the Olympic Games.
- GDOT HEROs provided an extremely flexible service for motorists and at the scene of accidents.
- GDOT HEROs have achieved widespread acceptance from the public and from agencies involved in incident management.
- GDOT HEROs were especially important during the Olympic Games, assisting with numerous bus breakdowns, and during bomb scares in downtown Atlanta.
- GDOT HEROs occasionally found themselves in situations where they overlooked safety risks.
- It is not possible to use existing TMC database systems to evaluate quantitatively the performance of the GDOT HEROs, or to measure their impact on incidents.

MARTA/ACOG Service Fleet

The MARTA/ACOG service fleet played an important role in incident management during the Olympic Games by responding to and resolving vehicle incidents for the OSTS operation. The responsibilities of the MARTA/ACOG service fleet included:

- Response to OSTS vehicle incidents on highways, arterials, venues, rail stations, and Park & Ride lots.
- Repair of OSTS vehicles at the scenes of incidents.
- Request for tow truck assistance for vehicles that could not be repaired onsite.
- Communication with appropriate OSTS management to update status and resolution action for incidents.

Service fleet vehicles and personnel were dispatched by the Supervisor of OSTS Bus Radio Operations upon receiving requests from bus operators for in-service (while the vehicle was in use) assistance. The MARTA/ACOG service fleet was dispatched from the terminals or while they were enroute in the regional area. In addition, the Supervisor of OSTS Bus Radio Operations had the authority to dispatch tow trucks from the terminals and from private contractors when internal availability was limited. The MARTA/ACOG service fleet was available during OSTS operating and non-operating hours throughout the Olympic Games.

OSTS vehicle incidents are presented in Table 3-9, which shows whether or not the vehicle had to be towed. Each incident log form indicated if the tow fleet was called to remove the vehicle. Based on this documentation, it was determined that, on average, 25.8 percent of all recorded incidents required that the vehicle be towed. Towing requirements ranged from a high of 40.0 percent of all incidents on July 21, 1996 (Day 3) to a low of 5.5 percent on August 1, 1996 (Day 14).

TABLE 3-9. OSTS Fleet Towing Data

Olympic Day	Date	Day	Total Incidents	Total Tows	Percent of Total Incidents	Percent on Freeways	Percent on Arterials	Percent on Other Locations
00	Prior to 7/19/96		63	13	20.6%	38.5%	23.1%	38.5%
01	7/19/96	Fri	39	8	20.5%	0.0%	25.0%	75.0%
02	7/20/96	Sat	68	10	14.7%	30.0%	40.0%	30.0%
03	7/21/96	Sun	50	20	40.0%	20.0%	20.0%	60.0%
04	7/22/96	Mon	86	24	27.9%	37.5%	41.7%	20.8%
05	7/23/96	Tue	64	20	31.3%	15.0%	35.0%	50.0%
06	7/24/96	Wed	94	28	29.8%	39.3%	35.7%	25.0%
07	7/25/96	Thu	62	15	24.2%	6.7%	33.3%	60.0%
08	7/26/96	Fri	118	37	31.4%	40.5%	21.6%	37.8%
09	7/27/96	Sat	49	11	22.4%	36.4%	18.2%	45.5%
10	7/28/96	Sun	39	11	28.2%	27.3%	18.2%	54.5%
11	7/29/96	Mon	68	16	23.5%	43.8%	43.8%	12.5%
12	7/30/96	Tue	58	16	27.6%	25.0%	43.8%	31.3%
13	7/31/96	Wed	64	18	28.1%	38.9%	38.9%	22.2%
14	8/1/96	Thu	55	3	5.5%	66.7%	0.0%	33.3%
15	8/2/96	Fri	40	9	22.5%	33.3%	22.2%	44.4%
16	8/3/96	Sat	26	8	30.8%	37.5%	37.5%	25.0%
17	8/4/96	Sun	11	2	18.2%	0.0%	0.0%	100.0%
Total Olympic Period			1,054	269	25.5%	31.2%	30.9%	37.9%
Average Olympic Day			58	15	25.8%	30.9%	31.2%	37.9%

Source: Spectator Command & Control Center Daily incident log

Data were analyzed to locate incidents involving towing and those located on freeways (including GA-400). Based on this analysis, it was determined that on average, 30.9 percent of all vehicles towed were located on freeways, 31.2 percent were on arterials, and the remainder were from other locations, such as Park & Ride lots, venues, and rail stations.

Incident Clearance Response

Data from the Spectator System Command and Control Center daily incident logs were reviewed in an attempt to analyze clearance times for OSTS recorded incidents. The daily incident logs were designed to record the following times for each incident:

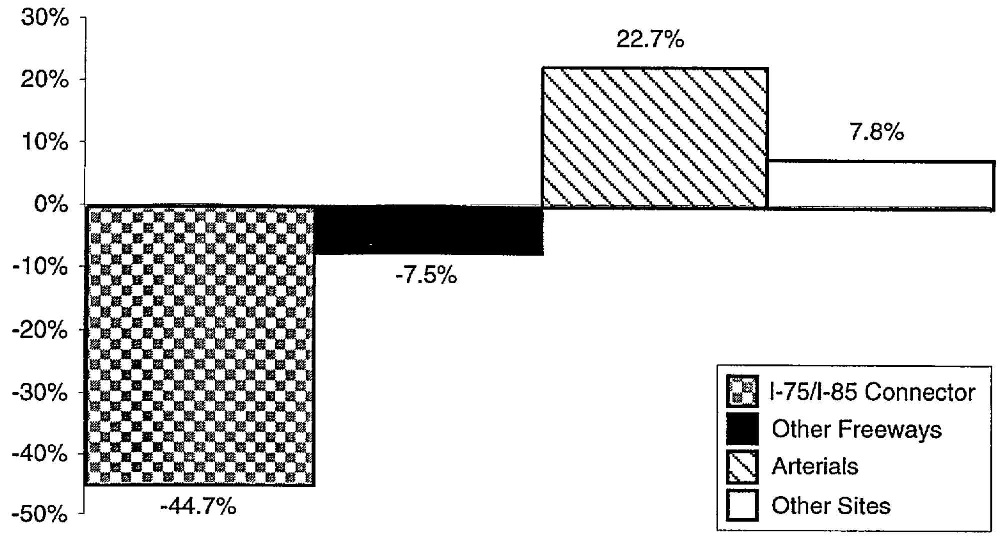
- Time identified: When the incident was first reported.
- Time assigned: When the incident was assigned to a supervisor/service fleet vehicle.
- Time cleared: When the incident was resolved by the supervisor/service fleet vehicle.

Similar to incidents at the TMC, some incidents tracked by the SSCCC had incomplete records. Of the 1,054 incident logs completed over the course of the Olympic Games, 62 percent contained time identified and time cleared data, while 52 percent contained time assigned and time cleared data. For these incidents, it was possible to calculate the clearance time after assignment of a supervisor/service fleet vehicle. Average clearance times were then derived and classified by incident location type-

Clearance time (after incident verification) for OSTS reported incidents (accidents and mechanical problems) on average, was 98 min for all locations. Often, more complicated problems, such as engine failure, were addressed at the sites such as shoulders or gore areas of the roadway.

It is important to note that the clearance time for transit incidents is not directly comparable with that reported for incidents tracked at the TMC, because transit incidents are not generally considered cleared until the vehicle concerned is back in operation. For incidents tracked by TMC, the clearance of travel lanes was the criterion used.

Figure 3-4 shows the difference between mean clearance times after incident identification for each location type (compared to the average for all locations).



Source: Spectator System Command and Control Center daily incident logs

FIGURE 3-4. Location Clearance Time Differences (Compared to Average for All Locations) After Incident Identification

This analysis reveals that incidents occurring on the I-75/I-85 connector were cleared 44.7 percent faster than the overall average for incident clearance. Resolving incidents on the connector received a high level of attention as part of the overall Olympic Games operations planning, since the connector was a critical link to continuous transportation operations. GDOT HERO patrols were heavily concentrated on this section of the freeway system, which probably contributed to the better-than-average performance. It appears that this focus was also followed by OSTS through its response to OSTS incidents located on the connector.

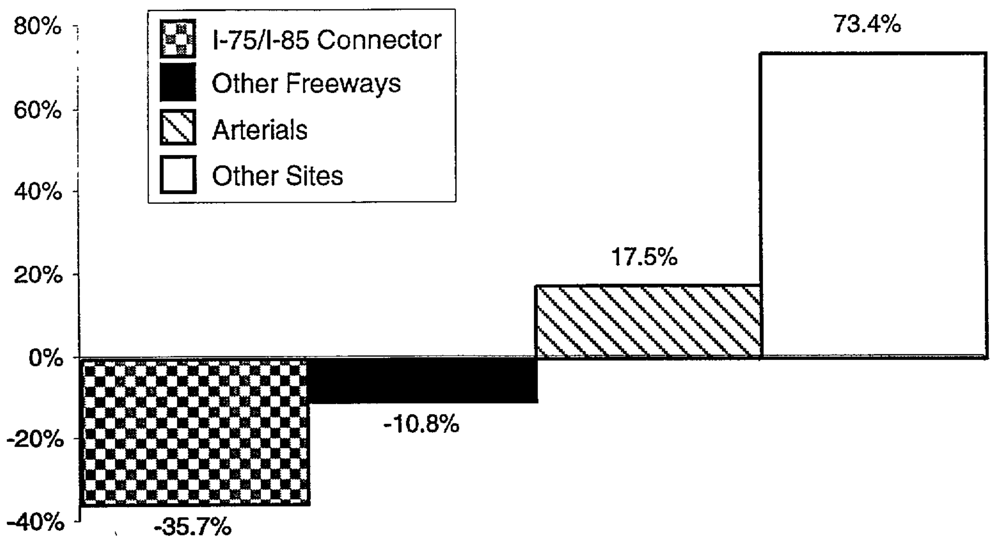
Similarly, incidents occurring on other freeways (and the GA-400, a limited access highway) were cleared 7.6 percent faster than the overall average for incident clearance. It appears that incidents on these highways also received a high level of attention by OSTS in terms of clearance and resolution. Again, GDOT HEROs patrolled some sections of these freeways, which probably contributed to this higher level of performance.

Incidents on arterials appeared to have experienced about a 22.7 percent higher mean clearance time than the mean for all incidents. In some cases, the incidents on arterials occurred along roads near Park & Ride lots and venues. The incidents were then cleared off the road and moved to one of these locations so as not to interfere with local traffic operations. In addition, incidents occurring at other locations (i.e., Park & Ride lots, venues, and rail stations) also demonstrated a clearance time slightly above the mean.

Clearance time (after time assigned) for OSTS reported incident, on average, was 66 min for all locations. This is 32 min less than the mean between time identified and time cleared. The reasons for the apparent time taken between incident identification and incident assignment are unknown, but could include:

- Limitations in service vehicle fleet availability, which may have resulted in some low-priority incidents experiencing excessive time before service vehicles were fully assigned.
- Higher frequency of incidents during the first week of the Olympic Games, which may have resulted in excessive time before service vehicles were assigned.

Figure 3-5 shows the difference between mean clearance times after incident assignment for each location type (compared to the average for all locations).



Source: Spectator System Command and Control Center daily incident logs

FIGURE 3-5. Location Clearance Time Differences (Compared to Average for All Locations) After Incident Assignment

This analysis reveals that incidents on the I-75/I-85 connector were cleared 35.7 percent and 10.8 percent faster, respectively, than the overall average for incident clearance. The mean time for incident clearance on arterials was 17.5 percent higher than the mean for all incidents. However, the largest difference occurred at other locations, with a mean incident clearance time that was 73.4 percent greater than that for all locations.

In conclusion, it is apparent that OSTS incident management for incidents on the connector, highways, and arterials received top resolution priority relative to other incidents. This was true for mean incident clearance time periods examined, from both the time identified to time cleared perspective and the time assigned to time cleared perspective.

In summary, the findings of the data analysis regarding incident clearance responses were as follows:

- On average, 25.8 percent of all recorded incidents required that a vehicle be towed. Towing requirements ranged from a high of 40.0 percent of all incidents on July 21,1996 (Day 3) to a low of 5.5 percent on August 1,1996 (Day 14).
- On average, 30.9 percent of all vehicles towed were located on the freeway system, 31.2 percent were located on arterials, and the remainder were at other locations, such as Park & Ride lots, event venues, and rail stations.
- OSTS incidents occurring on freeways were cleared noticeably faster than incidents on arterials or other locations. This was particularly true for incidents on the I-75/1-85 connector, for which mean clearance times that were 44.7 percent lower than the mean clearance time for all incidents.

3.3.1.5 Effectiveness of Transportation Management During: Incidents

The performance of TMC operators in managing incidents has already been shown to have improved noticeably as the games progressed. Most incidents were level 1 or level 2 and required minimal interagency coordination, usually between GDOT and the local police department (PD). The following discussion focuses on the effectiveness of transportation management for one of the few incidents involving more extensive interagency coordination.

As mentioned previously, the incident that **took the longest to clear was** an accident on northbound I-85. TMC operators dispatched the GSP helicopter to the scene, to provide aerial surveillance to supplement the CCTV camera coverage. Live video feed from the helicopter made it apparent that, in addition to a truck carrying a mobile home, the accident involved a tanker loaded with bulk cement. The tanker had run off the road into a ditch. This accident, which occurred at approximately 11:00 a.m. on Friday, July 26 (Day 8), took more than 6 h to clear. It was probably the most significant freeway incident during the games, in terms of the vehicle types involved, traffic disruption caused, and incident clearance resources required;

Several instances of interagency coordination were observed during the management of this incident. The county in which the accident occurred, together with a neighboring county, investigated the possibility of a freeway diversion, but they concluded that it was not feasible because of the difficulty of modifying signal timings. The local PD assumed control of the incident and instigated a local diversion using an adjacent frontage road in the immediate vicinity of the accident. TMC operators posted messages on CMSs to advise motorists of the incident. For the most part, no alternative routes existed for traffic, including OSTS shuttle buses passing through the accident site. While the local PD contacted MARTA regarding reroutes for regular MARTA Buses on surface streets, OSTS shuttle buses (managed by MARTA on behalf of ACOG), were also affected by freeway delays. MARTA TIC directed OSTS buses not already trapped in the congestion to use an alternative route, and then maintained contact with ATOC regarding any possible impact on spectator arrivals or departures for events.

At approximately 2:30 p.m., the local PD elected to recover the ditched tanker. (Local PD policy is to recover wrecks by 5:00 p.m. whenever possible.) All northbound lanes were closed for almost 30 min, while several heavy-duty wreckers were deployed. Under nongames traffic conditions, this timing would have been before the afternoon commute period. As stated earlier in this report, commute periods occurred earlier than normal during the Olympic Games, in this case, unfortunately coinciding with the period when the ditched tanker was being recovered. The consequence of the local PD's decision probably extended the duration and impact of the incident, at a time when the option existed to wait until later in the day. (There were no adverse weather or daylight conditions that necessitated vehicle recovery at that time.) The recovery decision was made without prior consultation with the local TCC, GDOT, or the TMC Command Table, although GDOT was known to have been experiencing difficulties with communications because of poor radio reception. Local TCC staff subsequently noted that communications with the local I'D were historically poor. The local PD were unaware of the TCC's access to cameras. The local I'D also did not participate in pre-games traffic meetings.

It could be argued that this was an isolated situation that increased motorist inconvenience. It was clear that some interagency coordination was taking place, although there were no direct communications between the TMC (or ATOC) and the local PD. This seemed surprising, given GDOT's responsibility for cleanup operations and the obvious need for freeway management.

The extent to which this incident may have been handled differently if it had occurred on a freeway in another county or in the city of Atlanta is not known. In view of the actions of the local I'D, this incident highlights a possible need to review interagency coordination arrangements for the management of major incidents, particularly to ensure that decisions are only taken after consideration of all relevant information.

Through the use of ITS field devices such as CCTV cameras and CMSs, the TMC provides surveillance and management capabilities beyond the incident scene. TMC can act as a communications hub, and will offer centralized dissemination of information when the TCCs and MARTA TIC are fully operational. In time, the centralized control of traffic signals in the surrounding counties will provide new traffic management capabilities on surface streets. Consequently, the role of TCCs will be significantly enhanced. This capability is critical to the success of automatically generated freeway diversion plans.

We are aware of an initiative by ARC for a new interagency approach to freeway incident management. ARC passed a resolution in 1991, establishing a freeway incident management program and a freeway incident management task force. The task force has formed four action teams, addressing:

- Incident management handbook: laws and regulations.
- Contract wrecker services/service patrols.
- Communications.
- Public awareness/promotional activities.

The first of these activities, the incident management handbook, is being jointly developed by ARC and GDOT. While implementation was suspended in 1995 during the build-up for the games, it is now understood that the handbook has been finalized and is currently pending a “launch” meeting. Implementation of such an approach, in conjunction with corresponding training, may improve interagency coordination during major incidents.

In summary, the findings of the data analysis regarding transportation management effectiveness during incidents **were** as follows:

- The local PD was not fully familiar with the capabilities of the ATMS during the games period.
- Management of the I-85 mobile home/bulk cement tanker incident resulted in avoidable traffic delays, **because** of a breakdown in communication between the local PD and GDOT/ATOC regarding the time chosen for recovering the wreck.
- Currently, there is an initiative underway by ARC for a new interagency approach to freeway incident management. An incident management handbook is **being** jointly developed by ARC and GDOT. It is understood this is currently pending a “launch” meeting. Implementation of such an approach, in **conjunction** with corresponding training, may improve interagency coordination during major incidents.

3.3.1.6 <u>Effectiveness of Incident Management for OSTS Operations</u>

The following discussion examines the effectiveness of incident management for OSTS incidents recorded during the Olympic Games. This section documents OSTS fleet incidents recorded during the games and examines how responses occurred. The analysis covers daily recorded incidents during the Olympic Games from communications logs, documenting the type and location of the incidents. A brief discussion of tow fleet data and average response times is also included.

Incident data are summarized as documented by OSTS Bus Radio Operations staff at the SSCCC in MARTA headquarters during the Olympic Games. The definition of incidents recorded here may differ somewhat from defined incidents on freeways, in that freeway incidents may only refer to accidents or vehicle stalls interfering with traffic operations. Transit incidents refer to any interruption to normal OSTS service, typically referred to as a "roadcall," that requires the response of a supervisory or service vehicle. Such incidents include mechanical problems, vehicle stalls, and accidents, regardless of their impact on traffic operations. Incidents occurring on the freeway system are also noted in the following discussions.

Transit incidents do not include calls received from bus operators for route directions, or other issues easily resolved by the dispatcher without sending a supervisory or MARTA/ACOG service vehicle. The data only include calls defined as incidents and referred by a radio dispatcher to the Supervisor of OSTS Bus Radio Operations. These calls generally involved an incident response requiring the dispatch of a service vehicle or tow truck. Dispatchers also handled numerous other calls not reflected in these data, incidents that were resolved individually by the dispatcher. In addition, the analysis does not attempt to determine the efficiency of the SSCCC operations. Rather, it documents the types of incidents that occurred and the manner in which responses to them were coordinated during the Olympic Games.

Incident Occurrence

In Table 3-10, incident data are compared to the "in-service vehicle fleet," defined as the number of vehicles required each day (or vehicles available, if lower), as reported by the terminals. On most days, the number of vehicles required was less than or very similar to the number of vehicles available. On three days (Days 6, 8 and 9), the vehicles available represented between 80 and 90 percent of the vehicles required.

As noted in Table 3-10, on average, 58 incidents per day were reported during the Olympic Games. The number of OSTS incidents ranged from a high of 118 incidents on July 26,1996 (Day 8), to a low of 11 incidents reported on August 4,1996 (Day 17). The OSTS reported incident rate (in relation to the in-service fleet) peaked on the first day of the Olympic Games, with a gradual decline during the following days, particularly during the second week of the Olympic Games.

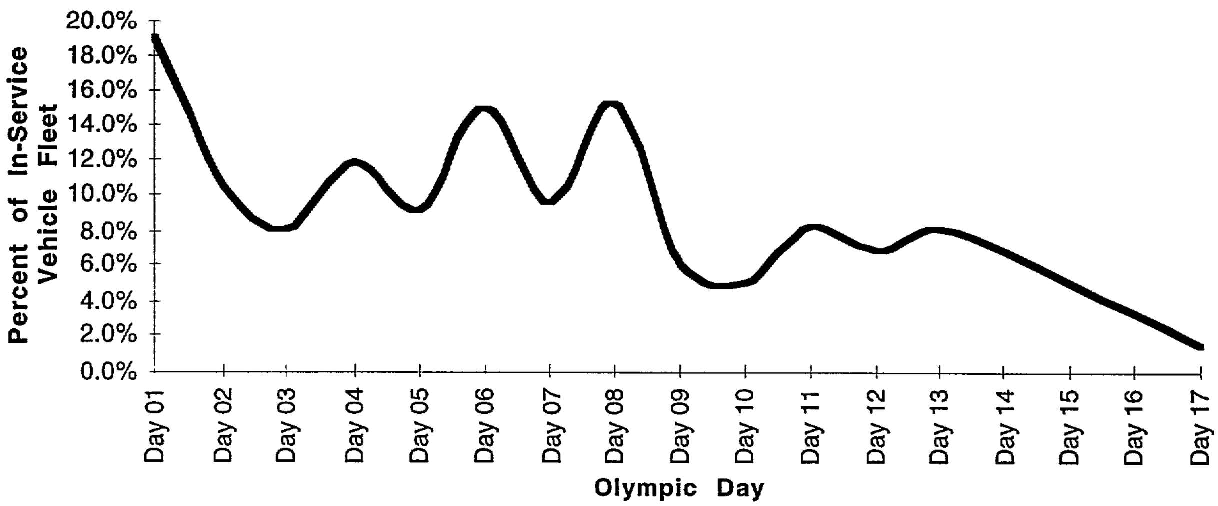
On average, 8.1 percent of OSTS' in-service vehicle fleet was involved in incidents. The highest incident rate was recorded on July 19,1996 (Day 1), at 19.0 percent. The lowest rate of incidents was experienced on the last day of the Olympics, August 4, 1996, with 1.5 percent of the in-service vehicle fleet involved in incidents.

Trends in incidents as a percentage of the in-service vehicle fleet over the course of the Olympic period are indicated in Figure 3-6.

TABLE 3-10. OSTS Recorded Incidents, as Percentage of Available Vehicles

Olympic Day	Date	Day	In-Service Vehicle Fleet	Recorded Incidents: Total Incidents	Recorded Incidents: Percent of In-Service Vehicle Fleet
0	Days Prior to 7/19/96		N/A	63	**N/A**
1	7/19/96	Fri	205	39	**19.0%**
2	7/20/96	Sat	657	68	**10.4%**
3	7/21/96	Sun	614	50	**8.1%**
4	7/22/96	Mon	720	86	**11.9%**
5	7/23/96	Tue	708	64	**9.0%**
6	7/24/96	Wed	632	94	**14.9%**
7	7/25/96	Thu	645	62	**9.6%**
8	7/26/96	Fri	777	118	**15.2%**
9	7/27/96	Sat	807	49	**6.1%**
10	7/28/96	Sun	793	39	**4.9%**
11	7/29/96	Mon	823	68	**8.3%**
12	7/30/96	Tue	855	58	**6.8%**
13	7/31/96	Wed	786	64	**8.1%**
14	8/1/96	Thu	814	55	**6.8%**
15	8/2/96	Fri	805	40	**5.0%**
16	8/3/96	Sat	783	26	**3.3%**
17	8/4/96	Sun	716	11	**1.5%**
Total Olympic Period			**N/A**	**1,054**	**N/A**
Average Olympic Day			**714**	**58**	**8.1%**

Source: Spectator System Command and Control Center Daily Incident Log and Terminal Reports



Source: Spectator System Command and Control Center

FIGURE 3-6. Incident Rates as Percentage of Available Fleet

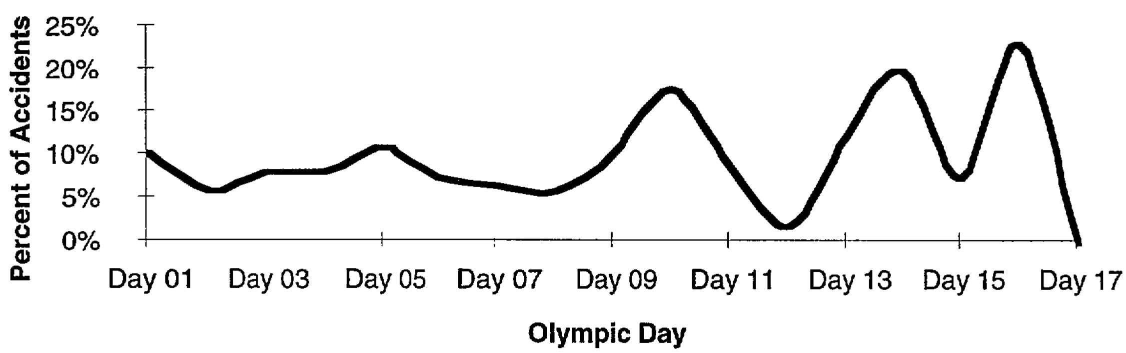
The overall trend appeared to be within a reasonable range, once operations were underway. Incidents as a percentage of the in-service vehicle fleet peaked at the beginning of the Olympic Games, on Day 1, and experienced three lower peaks, on Days 4, 6, and 8, with a gradual decrease thereafter. The decrease in incidents was likely the result of familiarization with OSTS operations by new operating and maintenance staff, as well as the completion of start-up troubleshooting for the OSTS fleet.

Incident Types

Data on fleet incidents are separated into mechanical incidents and accidents in Table 3-11. Mechanical incidents included stalls, hot engines, fuel problems, transmission failures, air-conditioning problems, and brake problems. Accidents were incidents involving physical damage to a bus, caused by striking another vehicle or object. Other types of road calls included repairs to wheelchair lifts, malfunctioning doors, and exterior damage, e.g., broken mirrors, and damaged radio antennas.

On average, 90.8 percent of incidents involved mechanical failure. Of all incidents, 33.5 percent were vehicle stalls, and 17.3 percent were overheated engines. The remaining incidents were evenly distributed among the other classifications. Incidents such as air-conditioning problems appeared seldom, at 0.9 percent. Such problems were probably addressed on a daily basis at the terminals and not through calls to the SSCCC.

On average, 9.2 percent of incidents were classified as vehicle accidents. The trend of accidents during the Olympic Games is outlined in Figure 3-7.



Source: Spectator System Command and Control Center

FIGURE 3-7. Accident Rates—Ratio of Accidents to All Incidents

TABLE 3-11. OSTS Recorded Incidents, by Type of Incident

Olympic Day	Date	Day	Total Incidents	Stall	Hot Engine	Accident	Other Mechanical	Fuel	Brake	Trans-mission	Wheelchair Lift	Exterior Damage	Tire	Door	Nonmechan-ical	A/C	Not Identified
	Prior to 7/19/96		63	34.9%	9.5%	11.1%	4.8%	7.9%	7.9%	3.2%	3.2%	3.2%	1.6%	4.8%	0.0%	0.0%	7.9%
Day 01	7/19/96	Fri	39	46.2%	12.8%	10.3%	5.1%	2.6%	7.7%	0.0%	2.6%	5.1%	0.0%	2.6%	0.0%	0.0%	5.1%
Day 02	7/20/96	Sat	68	44.1%	16.2%	5.9%	2.9%	2.9%	4.4%	4.4%	4.4%	2.9%	1.5%	2.9%	2.9%	1.5%	2.9%
Day 03	7/21/96	Sun	50	22.0%	12.0%	8.0%	4.0%	16.0%	8.0%	2.0%	6.0%	4.0%	2.0%	4.0%	0.0%	2.0%	10.0%
Day 04	7/22/96	Mon	86	38.4%	19.8%	8.1%	10.5%	2.3%	2.3%	3.5%	1.2%	1.2%	3.5%	1.2%	1.2%	2.3%	4.7%
Day 05	7/23/96	Tue	64	29.7%	14.1%	10.9%	7.8%	7.8%	4.7%	1.6%	4.7%	0.0%	4.7%	1.6%	0.0%	4.7%	7.8%
Day 06	7/24/96	Wed	94	33.0%	19.1%	7.4%	6.4%	11.7%	4.3%	1.1%	2.1%	0.0%	0.0%	5.3%	3.2%	2.1%	4.3%
Day 07	7/25/96	Thu	62	32.3%	11.3%	6.5%	6.5%	8.1%	1.6%	8.1%	3.2%	6.5%	3.2%	3.2%	4.8%	0.0%	4.8%
Day 08	7/26/96	Fri	118	31.4%	15.3%	5.9%	10.2%	12.7%	5.9%	0.8%	6.8%	2.5%	2.5%	1.7%	2.5%	0.0%	1.7%
Day 09	7/27/96	Sat	49	32.7%	12.2%	10.2%	10.2%	10.2%	14.3%	2.0%	2.0%	0.0%	4.1%	0.0%	2.0%	0.0%	0.0%
Day 10	7/28/96	Sun	39	30.8%	15.4%	17.9%	5.1%	5.1%	2.6%	2.6%	10.3%	7.7%	0.0%	0.0%	0.0%	0.0%	2.6%
Day 11	7/29/96	Mon	68	32.4%	11.8%	8.8%	4.4%	11.8%	10.3%	8.8%	4.4%	2.9%	1.5%	2.9%	0.0%	0.0%	0.0%
Day 12	7/30/96	Tue	58	43.1%	19.0%	1.7%	15.5%	3.4%	1.7%	5.2%	1.7%	1.7%	3.4%	1.7%	1.7%	0.0%	0.0%
Day 13	7/31/96	Wed	64	34.4%	20.3%	12.5%	3.1%	4.7%	6.3%	7.8%	3.1%	0.0%	1.6%	3.1%	0.0%	1.6%	1.6%
Day 14	8/1/96	Thu	55	30.9%	10.9%	20.0%	9.1%	3.6%	3.6%	1.8%	3.6%	10.9%	3.6%	0.0%	1.8%	0.0%	0.0%
Day 15	8/2/96	Fri	40	25.0%	27.5%	7.5%	7.5%	7.5%	5.0%	2.5%	7.5%	7.5%	0.0%	0.0%	2.5%	0.0%	0.0%
Day 16	8/3/96	Sat	26	30.8%	11.5%	23.1%	3.8%	7.7%	7.7%	0.0%	7.7%	7.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Day 17	8/4/96	Sun	11	0.0%	45.5%	0.0%	9.1%	0.0%	18.2%	27.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total Olympic Period			**1,054**	**33.5%**	**15.7%**	**9.3%**	**7.2%**	**7.7%**	**5.7%**	**3.6%**	**4.1%**	**3.1%**	**2.1%**	**2.3%**	**1.5%**	**0.9%**	**3.2%**
Average Olympic Day			**58**	**33.5%**	**16.1%**	**9.2%**	**7.4%**	**7.7%**	**5.6%**	**3.6%**	**4.1%**	**3.1%**	**2.1%**	**2.1%**	**1.6%**	**0.9%**	**2.9%**

Source: Spectator System Command and Control Center daily incident log

The highest percentage of accidents occurred on August 3, 1996 (Day 16), with 23.1 percent of the incidents classified as accidents. The lowest percentage of accidents was reported the following day-the closing day of the Games-with none of the incidents classified as a accidents. Excluding that day, the lowest percentage of accidents was reported on July 30, 1996 (Day 12), with only 1.7 percent of incidents classified as accidents. The actual number of accidents was typically between four and seven each day. The highest number of accidents on any one day was 11, on August 1, 1996 (Day 14).

Incident Location

The recorded incidents data in Table 3-12 were also analyzed to determine incident location, based on the information included on the incident report forms completed by the SSCCC. The freeway category included GA-400.

Incidents occurred in a variety of locations. On average, 26.9 percent occurred at Park & Ride lots, 26.0 percent occurred on local arterials, 23.2 percent occurred on freeways, 13.1 percent occurred at venues, and 8.3 percent occurred at rail stations. Also, on average, 3.7 percent of incidents occurred on the I-75/1-85 connector.

Interagency Coordination

As **previously** described, each OSTS incident resulted in a radio call from the bus operator to the **OSTS** System Command and Control Center. In the first few days of the Olympic Games, MARTA TIC operators selectively entered incident data into the IMS database, including incidents affecting MARTA fixed routes. However, MARTA TIC operators were unsure if this information could be accessed by other ATMS users and, if so, how it was used. MARTA TIC lost access to the IMS after Day 3 of the games. In effect, MARTA was in possession of incident management information for which the only practical means of sharing with the TMC and the TCCs was via telephone. While some of these incidents, particularly those on freeways, would eventually have become known to the TMC, many were known to MARTA for some period of time before that.

In summary, the findings of the data analysis regarding OSTS incident type, location, and frequency were as follows:

- On average, 58 OSTS incidents per day were reported during the Olympic Games. The number of OSTS incidents ranged from a high of 118 on July 26, 1996 (Day 8), to a low of 11 incidents on August 4,1996 (Day 17).
- On average, 8.1 percent of OSTS' available fleet were involved in incidents. The highest incident rate is recorded on July 19,1996 (Day 1) at 19.0 percent. The lowest incident rate was on the last day of the Olympics-August 4,1996-with 1.5 percent of available vehicles involved in incidents.

TABLE 3-12. OSTS Recorded Incidents, by Location

Olympic Day	DATE	Day	Total Incident	I-75/I-85 Connect	Other Freeways						Arterials	Park & Ride	Other Sites			Not Identified	
					I-20	I-75	I-85	I-285	GA-400	Subtotal	Subtotal		Venue	Terminal	MARTA Station		Subtotal
	Days Prior to 7/19/96		63	1.6%	3.2%	3.2%	4.8%	12.7%	1.6%	27.0%	23.8%	19.0%	12.7%	0.0%	14.3%	3.2%	49.2%
Day 01	7/19/1996	Fri	39	0.0%	0.0%	2.6%	2.6%	2.6%	0.0%	7.7%	38.5%	12.8%	7.7%	0.0%	33.3%	0.0%	23.8%
Day 02	7/20/1996	Sat	68	1.5%	1.5%	8.8%	5.9%	8.8%	4.4%	30.9%	26.5%	33.8%	2.9%	0.0%	5.9%	0.0%	42.6%
Day 03	7/21/1996	Sun	50	4.0%	4.0%	2.0%	2.0%	0.0%	2.0%	14.0%	26.0%	38.0%	22.0%	0.0%	0.0%	0.0%	60.0%
Day 04	7/22/1996	Mon	86	2.3%	8.1%	10.5%	7.0%	1.2%	5.8%	34.9%	27.9%	19.8%	7.0%	0.0%	3.5%	7.0%	37.2%
Day 05	7/23/1996	Tue	64	7.8%	1.6%	3.1%	7.8%	8.3%	0.0%	26.6%	25.0%	35.9%	9.4%	1.6%	1.6%	0.0%	48.4.%
Day 06	7/24/1996	Wed	94	3.2%	7.4%	3.2%	10.6%	1.1%	0.0%	25.5%	21.3%	33.0%	8.5%	0.0%	10.6%	1.1%	53.2%
Day 07	7/25/1996	Thu	62	1.6%	4.8%	1.6%	1.6%	0.0%	0.0%	9.7%	29.0%	25.8%	16.1%	0.0%	17.7%	1.6%	61.3%
Day 08	7/26/1996	Fri	118	0.8%	8.5%	8.5%	5.9%	2.5%	2.5%	28.8%	21.2%	23.7%	18.6%	0.8%	4.2%	2.5%	50.0%
Day 09	7/27/1996	Sat	49	4.1%	4.1%	0.0%	8.2%	0.0%	0.0%	16.3%	26.5%	22.4%	28.6%	0.0%	0.0%	6.1%	57.1%
Day 10	7/28/1996	Sun	39	7.7%	7.7%	5.1%	0.0%	0.0%	0.0%	20.5%	20.5%	35.9%	17.9%	0.0%	5.1%	0.0%	59.0%
Day 11	7/29/1996	Mon	68	5.9%	2.9%	1.5%	5.9%	1.5%	0.0%	17.6%	30.9%	25.0%	17.6%	0.0%	5.9%	2.9%	51.5%
Day 12	7/30/1996	Tue	58	5.2%	1.7%	3.4%	6.9%	1.7%	3.4%	22.4%	31.0%	20.7%	12.1%	1.7%	10.3%	1.7%	46.6%
Day 13	7/31/1996	Wed	64	6.3%	1.6%	4.7%	4.7%	1.6%	3.1%	21.9%	29.7%	31.3%	7.8%	0.0%	7.8%	1.6%	48.4%
Day 14	8/1/1996	Thu	55	1.8%	7.3%	0.0%	3.6%	3.6%	5.5%	21.8%	23.6%	21.8%	16.4%	0.0%	16.4%	0.0%	54.5%
Day 15	8/2/1996	Fri	40	7.5%	0.0%	2.5%	2.5%	7.5%	7.5%	27.5%	20.0%	30.0%	10.0%	0.0%	10.0%	2.5%	52.5%
Day 16	8/3/1996	Sat	26	7.7%	0.0%	0.0%	7.7%	0.0%	15.4%	30.8%	30.8%	15.4%	11.5%	3.8%	7.7%	0.0%	38.5%
Day 17	8/4/1996	Sun	11	0.0%	0.0%	0.0%	9.1%	0.0%	0.0%	9.1%	9.1%	27.3%	9.1%	0.0%	27.3%	18.2%	81.8%
Total Olympic Period			1,054	3.6%	4.4%	4.2%	5.6%	3.0%	2.6%	23.3%	25.9%	26.5%	13.1%	0.4%	8.6%	2.2%	50.8%
Average Olympic Day			58	3.7%	4.4%	4.2%	5.7%	2.4%	2.6%	23.2%	26.0%	26.9%	13.1%	4.0%	8.3%	2.1%	50.8%

Source: Spectator System Command & Control Center daily incident log

- On average, 90.8 percent of all incidents involved mechanical failure, and 33.5 percent of all incidents were vehicle stalls, and 16.1 percent of all incidents were hot engines, accounting for the majority of all incidents.
- On average, 9.2 percent of incidents were classified as vehicle accidents. The highest percentage of accidents occurred on August 3, 1996 (Day 16), with 23.1 percent of the incidents classified as accidents. The lowest percentage of accidents was reported the following day-the closing day of the Games-with none of the incidents classified as accidents.
- The actual number of incidents was typically between four and seven each day. The highest number of accidents on any single day was 11, on August 1, 1996 (Day 14).
- On average, 26.9 percent of incidents occurred at Park & Ride lots, 26.0 percent occurred on local arterials, 23.2 percent occurred on freeways, 13.1 percent occurred at venues, and 8.3 percent occurred at rail stations.
- MARTA was in possession of incident information for which the only practical means of sharing with the TMC and the TCCs was via telephone. While some of these incidents, particularly those on freeways, would eventually have become known to the TMC, many were known to MARTA for some period of time before that.

3.3.2 Effectiveness of the TMC Incident Management System (IMS) Software

The ITI groupings covered were:

- Freeway Management.
- Incident Management.
- Transit Management.

Once an incident has been declared, the IMS software helps the TMC operators manage the incident. Part of this process is the generation of an agency contact list indicating who should be informed about the incident status. For level 2 and higher incidents, the IMS can also generate response plans, based on the characteristics of individual incidents. A response plan comprises suggested CMS and HAR messages. Also, response plans cannot be implemented without the prior approval of a TMC operator. However, as discussed earlier, the HAR was not operational during the games. It is understood that in the future, incident response plans may also include freeway diversions.

During the Olympic and Paralympic Games, the TMC planning operators were responsible for implementation of the response plans. Regular TMC operators were not authorized to fulfill this role, because of the specialized nature of the task, which requires a clear understanding of driver behavioral response to posted messages. The

TMC planning operators did not track potential incidents, nor did they declare confirmed incidents or handle calls required by the contact list. The TMC planning operators were responsible for supervising incident response plans, modifying them to reflect changing circumstances, and ensuring their timely removal. This involved reviewing, accepting, and implementing IMS-generated response plans, and also modifying or developing response plans manually when needed. **TMC** planning operators were also responsible for requesting and communicating with the GSP helicopter.

3.3.2.1 Extent of TMC Response Plans Use

For the 152 incidents tracked by BA&H observers, the following response categories were noted:

- No response plan was generated for 113 incidents, which included incidents on certain freeways, e.g., the I-285 perimeter, and others outside the perimeter, for which system-generated response plans did not exist. For 21 of these incidents, response plans **were** generated manually. This category also included the 42 level 1 incidents, for which response plans were not normally generated.
- Response plans generated by the IMS were accepted as is for 19 incidents.
- Response plans generated by the IMS were modified for 11 incidents.
- Response plans generated by the IMS were rejected for 9 incidents.

The reasons for modification or rejection of response plans included situations in which:

- CMSs were already in use with another previously posted message.
- The response plan was incomplete or incorrect.
- The response plan was judged to be inappropriate.
- The **time** taken to place the icon was too long.
- Circumstances changed during the incident.

On four occasions, the TMC planning operators implemented incident response plans manually, rather than wait for the IMS software to generate a plan after icon placement. TMC operators became more adept at placing icons as the games progressed, and TMC planning operators relied less on manual response plans when they knew an icon was in the process of being placed, and for which the IMS could generate a response plan.

When a manual plan had to be used, TMC operators would occasionally forget to inform the TMC planning operator that circumstances relating to the incident had changed. This caused minor delays in updating plans.

For HOV lane CMSs, system-generated response plans did not exist, and TMC planning operators had to prepare and post all messages manually. As TMC planning operators developed familiarity with the IMS, it became apparent that incident type, “other,” would result in the nongeneration of a response plan. Regular TMC operators were advised to avoid the use of this designation wherever possible when declaring an incident.

During the first week of the Olympic Games, the CMS server crashed every 256 minutes because of a buffer storage problem. This prevented CMS message posting, and also necessitated reposting of semipermanent HOV lane CMS messages.

Whenever response plans were generated, BA&H observers noted that TMC planning operators terminated them in a timely fashion.

BA&H observers in the TMC noted one specific procedural issue for consideration by GDOT. When vehicles involved in an incident moved to the shoulder, the TMC standard operating procedures direct operators to terminate the incident so that the icon can be deleted. Deleting the icon is important to the Atlanta TIS interface, which continues to report the incident on systems such as the Internet as long as an icon is in place. However, deleting the icon cancels any IMS-generated response plan, even though the IMS software can automatically update the response plan to reflect the changed characteristics of the incident. For incidents that create extensive traffic back-ups, deleting the icon may be premature, especially if traffic congestion continues, requiring that a response plan be manually implemented.

In summary, the findings of the data analysis regarding the use of response plans in the TMC were as follows:

- The majority of incidents occurred in locations where response plans could not be generated by the system. Manual response plans were prepared for 21 of these incidents.
- Incident response plans did not include HOV lane CMSs.
- System-generated response plans were accepted without modification for 19 out of 152 incidents.
- TMC planning operators were diligent in their use of system generated response plans, including timely termination.
- When vehicles involved in an incident are moved to the shoulder the TMC standard operating procedures direct operators to terminate the incident so that the icon can be deleted. For incidents that create extensive traffic back-up

deleting the icon may be premature, especially if traffic congestion continues to the extent that a response plan has to be manually implemented.

3.3.2.2 Extent of MARTA TIC IMS Use

The MARTA TIC had access to IMS on a computer terminal available to the Chief of Radio Communications and the TIC managers. Observations of MARTA TIC operations and discussions with its staff indicated that IMS was up and running during the first three days of the Olympic Games. The IMS system was observed to display incident management information that had been input by the TMC.

During the first three days of the Olympic Games, managers at the MARTA TIC had the capability to enter transit incidents into the data input page of the IMS. One specific incident involved an accident on a major arterial heavily used by MARTA Bus fixed-route service. Due to the severity of the accident and the resulting congestion, MARTA Bus rerouted service around the accident scene onto an adjacent arterial. A MARTA TIC manager input the transit incident information into the IMS system for transmission to TMC. This was the first transit incident entered into the system from the MARTA TIC, which was very interested in establishing this communication link with TMC. Based on observations and discussions with MARTA TIC staff, it was not known whether this information had been received by TMC or if it had been used for any response purposes.

On about Day 4 of the Olympic Games, the IMS no longer functioned properly and was not accessible to the MARTA TIC. The IMS system remained in this state throughout the remainder of the Olympic Games. MARTA TIC staff indicated that a software change made at the TMC had caused the system to become inaccessible. They also expressed disappointment in not being able to access the IMS system for the remainder of the Olympic Games. Staff indicated that the IMS system offered a real opportunity for TMC and the MARTA TIC to communicate on incident issues for the first time. In addition, MARTA TIC staff felt that they had lost an important resource for assisting their operations with incident identification and awareness. An official explanation for the loss of IMS functionality was not conveyed to the MARTA TIC from TMC during the Olympic Games. No response instructions were given on how to restart the system for future use. However, based on discussions with MARTA TIC staff following the Olympic Games, IMS is now operational and accessible.

In summary, the findings of the data analysis regarding MARTA TIC IMS used were as follows:

- The MARTA TIC had access to the IMS on a terminal available to the Chief of Radio Communications and Managers of the MARTA TIC. IMS was up and running during the first three days of the Olympic Games.

- Managers in the MARTA TIC used IMS to enter incidents into the data input page. One specific incident involved an accident on a major arterial that is heavily used by MARTA Bus for its fixed-route service.
- On Day 4 of the Olympic Games, IMS was no longer accessible to the MARTA TIC and remained in this state throughout the remainder of the games. MARTA TIC staff indicated that a software change made at the TMC had caused the system to become inaccessible at their level.
- Managers in the MARTA TIC expressed disappointment in not being able to access the IMS for the remainder of the games. IMS offered a real opportunity for TMC and the TIC to communicate for the first time on incident issues.

3.3.2.3 Extent of TCC IMS Use

Although some TCCs had access to IMS software and had received training, IMS was not used during the games. The TCCs did not function as incident management centers and did not log any incidents into the IMS database. Involvement by TCCs in incident management did not extend beyond the use of CCTV cameras for monitoring incidents.

3.3.2.4 **Speed of System Response at TMC**

IMS-generated response plans were invariably generated quickly and implemented within minutes of icon placement. The speed of system response was fast and did not present any problems.

3.3.2.5 Ease **of TMC IMS Use**

BA&H observers noted that, on four occasions, icons were placed incorrectly. This was mostly due to operator error and occurred predominantly in the first week of the Olympic Games. Otherwise, the system did not present any problems.

3.3.3 Effectiveness of the Traffic Surveillance Components

This section presents information on the effectiveness of the following traffic surveillance components:

- Atlanta metropolitan area.
- Different zones within the metropolitan area.

The effectiveness of individual components was based on the extent to which each was used to detect and verify incidents.

The IT1 groupings covered were:

- Freeway Management.
- Incident Management.

3.3.3.1 Atlanta Metropolitan Area

The TMC relies on a range of devices and resources for monitoring traffic movements and for detecting incidents, particularly, but not exclusively, on freeways. Using the same sample as for incident management analyses earlier (for those incidents where reporting data were available), Table 3-13 indicates how incidents were first reported and Table 3-14 indicates how they were subsequently verified. It is immediately apparent that the method of first reporting an incident was spread across almost the entire range of available methods, with no single method predominating. The top three methods of incident detection, CCTV, Metro Networks, and GDOT HEROs represented resources or devices that had a specific incident detection role during the games. Together, they were the method of first reporting for nearly half the incidents detected. The *DOT call takers, Atlanta TIS, and roving GDOT personnel also made a significant contribution to incident detection.

TABLE 3-13. Incident Detection-Method of First Report

Detection Method	Number of Incidents					
Incident Level	**1**	**2**	**3**	**4**	**Total**	**%**
CCTV camera	8	8	5	1	22	19
Metro Network	5	10	2	1	18	16
GDOT HERO unit	5	8	2	0	15	13
*DOT calls	4	6	3	1	14	12
Atlanta TIS	3	6	3	1	13	11
GDOT personnel	4	5	1	0	10	9
Media	0	3	3	1	7	6
County/City TCC	4	1	0	0	5	4
GSP personnel	0	3	2	0	5	4
County/City PD	1	1	2	0	4	4
GEMA personnel	0	0	1	0	1	1
Total	34	51	24	5	114	99

Source: BA&H observations in the GDOT TMC

TABLE 3-14. Incident Detection—Method of Verification

Verification Method	Number of Incidents					
Incident Level	1	2	3	4	Total	%
CCTV camera	11	29	10	3	53	42
GDOT HERO unit	8	5	8	1	22	18
GDOT personnel	6	4	2	0	12	10
County/City PD	1	7	3	1	12	10
Metro Network	4	4	1	0	9	7
County/City TCC	5	1	0	0	6	5
GSP personnel	0	2	3	1	6	5
Atlanta TIS	1	2	0	0	3	2
Fire Department	0	1	0	1	2	2
Total	36	55	27	7	125	101

Source: BA&H observations in the GDOT TMC

The media reported more incidents to the TMC than GSP, although this may reflect the fact that GSP's other transportation roles during the Olympic Games had a higher priority. In addition, the media was capable of more aerial coverage of the transportation system.

Figure 3-8 reflects GDOT's guidelines regarding the criteria that must be satisfied before an incident is deemed verified. Eighty percent of incidents were verified by CCTV, GDOT HEROs, GDOT personnel at the incident scene, and PDs. The remainder required verification by other agencies.

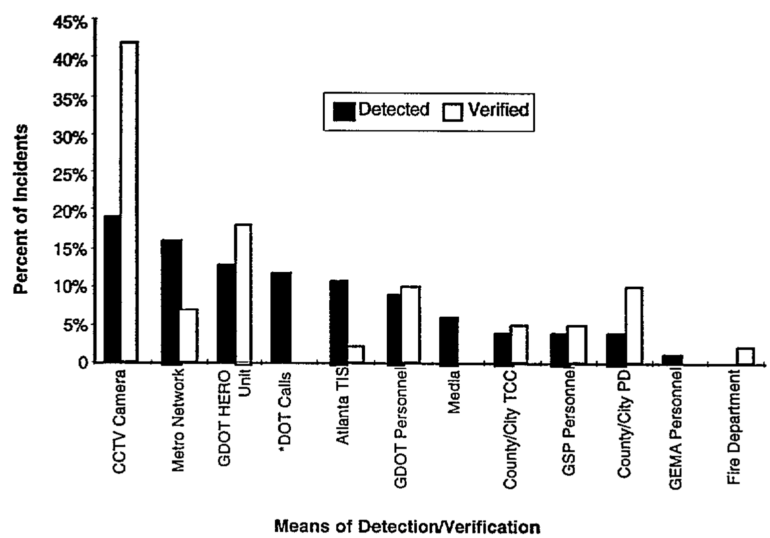


FIGURE 3-8. Detection/Verification of Incidents

With respect to non-freeway CCTV coverage, the following comments are made:

- There was only limited functionality during the games. CCTV cameras were installed in the city of Atlanta, Gwinnett County, and De Kalb County.
- Because of their high vantage point, CCTV cameras on Georgia Dome were used extensively by Atlanta TCC to observe and respond to congestion, and by the TMC to observe traffic flow toward the entrance ramps.
- The GSP helicopter was used on a number of occasions by the TMC. BA&H observations in the TMC found that criteria for requesting the helicopter were unclear, and video image quality was varied (but always inferior to the APD blimp and media helicopters). However, the GSP helicopter was used very effectively on two specific occasions:
  - Aerial surveillance of the Courtland Street area during the early days of the Olympic Games, to monitor recurrent traffic congestion and to establish reasons for poor traffic circulation.
  - A major accident on I-85 northbound during the Olympic Games, when aerial surveillance provided the first evidence to the TMC of a tractor trailer that had run off the road.
- Aerial surveillance by the APD blimp was monitored at the TMC, but was ineffective for incident detection because the TMC had no control over the video feed or the position of the blimp.

In summary, the findings of the data analysis regarding the effectiveness of the traffic surveillance components in the Atlanta metropolitan area were as follows:

- The top three methods of incident detection, CCTV, Metro Networks, and GDOT HEROs, represented resources or devices that had a specific incident detection role during the games. Together, they were the method of first reporting for nearly half of the incidents detected.
- The *DOT call takers, Atlanta TIS, and roving GDOT personnel also made a significant contribution to incident detection.
- Consistent with GDOT's guidelines regarding the criteria that must be satisfied before an incident is deemed verified, 80 percent of incidents were verified by CCTV, GDOT HEROs, GDOT personnel at the incident scene, and PDs.
- The remainder mostly required verification by other agencies.
- In keeping with experiences elsewhere around the nation, aerial surveillance can be very effective, on occasion, but clear criteria for its use need to be established.

3.3.3.2 Comparison bv Geographic Zone

For a better understanding of the relative performance of incident detection and verification at different locations around the metropolitan area, the freeways were divided into two geographic zones:

- Inside the I-285 perimeter.
- On and outside the I-285 perimeter.

For incidents located within the perimeter (Table 3-15), two-thirds were detected by CCTV, GDOT HEROs, and *DOT callers. GDOT personnel at the incident scene and Atlanta TIS also detected a significant number of incidents. For incidents located on and outside the perimeter, the pattern was noticeably different. More than half were detected by Metro Network spotters, Atlanta TIS, and the TCCs. The remainder were detected by a variety of methods, including GDOT HEROs, *DOT callers, media sources, GDOT personnel, GSP, and PDs.

TABLE 3-15. Incident Detection-Method of First Report, by Zone

Detection Method	Number of Incidents (Inside Perimeter)		Number of Incidents (Perimeter and Outside Perimeter)	
	Total	%	Total	%
CCTV camera	20	32	2	4
GDOT HERO unit	11	18	4	8
*DOT caller	10	16	4	8
GDOT personnel	6	10	3	6
Atlanta TIS	5	8	8	16
Metro Network	4	6	14	27
Media	3	5	4	8
GSP personnel	2	3	3	6
County/City PD	1	2	3	6
County/City TCC	0	0	5	10
GEMA personnel	0	0	1	2
Total	62	100	51	101

Source: BA&H observations in the GDOT TMC

Clearly this is consistent with the massive deployment of CCTV cameras and HERO patrols, which were mostly inside the perimeter, and also with the positioning of the Metro Network spotters and Atlanta TIS, which were mostly deployed on and outside the perimeter. The significant point is that the future of the Metro Network spotters and Atlanta TIS in the post-games situation is uncertain. This coverage uncertainty may potentially impact GDOT's future ability to detect incidents on and outside the perimeter efficiently.

For incidents located within the perimeter (Table 3-16), 90 percent were verified by CCTV, GDOT HEROs, and GDOT personnel at the incident scene. The remainder were verified by emergency services personnel. For incidents located on and outside the perimeter, the pattern was noticeably different: 81 percent were verified **by** county/city PDs, Metro Network spotters, CCTV, GDOT HEROs, and the TCCs. Again, this follows the massive deployment of CCTV and GDOT HEROs inside the perimeter, and the dependence on a variety of verification methods on and outside the perimeter. As with incident detection, Metro Network spotters played an important role in verification. Any reduction in their coverage may potentially impact GDOT's future ability to verify incidents on and outside the perimeter.

TABLE 3-16. Incident Detection-Method of Verification, by Zone

Verification Method	Number of Incidents (inside Perimeter)		Number of Incidents (Perimeter and Outside Perimeter)	
	Total	%	Total	%
CCTV camera	44	61	9	17
GDOT HERO unit	14	19	8	15
GDOT personnel	7	10	4	8
GSP personnel	3	4	3	6
County/City PD	2	3	10	19
Fire Department	2	3	0	0
Atlanta TIS	0	0	3	6
Metro Network	0	0	9	17
County/City TCC	0	0	6	12
Total	72	100	52	100

Source: BA&H observations in the GDOT TMC

BA&H observers noted that TMC operators were able to use video imaging cameras to supplement the CCTV cameras. Video imaging cameras, located on the I-75 and I-85 freeways mostly within the perimeter, provided a monochrome image and were necessarily in a fixed position, i.e., they did not have a pan-tilt-zoom control capability. However, their extensive deployment (319 cameras) on freeways inside the perimeter provided additional flexibility to TMC operators. Conversely, the TMC operators found the slow-scan cameras located around the perimeter less easy to use, because of the time needed for the video display to be updated during pan-tilt-zoom maneuvers. Also, the camera number on the video display did not appear on the reference maps used to select CCTV cameras.

BA&H observers noted the contrast between the confidence with which TMC operators could verify and manage incidents where CCTV coverage was available (predominantly, I-75 and I-85 inside the perimeter) versus those where it was not (I-20, I-285 perimeter, US-78). This was compounded by the relatively low level of coverage by GDOT HERO patrols on the perimeter. Part of one patrol route covered the perimeter, the section between I-85 and I-20 east of Atlanta. This patrol also included US-78 to Stone Mountain National Park.

In summary, the findings of the data analysis for this segment of the Event Study were as follows:

- For incidents located within the perimeter, two-thirds were detected by CCTV, GDOT HEROs, and "DOT callers.
- For incidents located on and outside the perimeter, more than half were detected by Metro Network spotters, Atlanta TIS, and the TCCs.
- Any reduction in the coverage of the Metro Network spotters and Atlanta TIS in the post-games situation may potentially impact GDOT's future ability to detect incidents on and outside the perimeter.
- For incidents located within the perimeter, 90 percent **were** verified by CCTV, GDOT HEROs, and GDOT personnel at the incident scene.
- For incidents located on and outside the perimeter, 81 percent were verified by county/city PDs, **Metro Network spotters, CCTV,** GDOT HEROs, and the TCCs.
- Any reduction in the coverage of the Metro Network spotters in the post-games situation may potentially impact GDOT's future ability to verify incidents on and outside the perimeter.
- Video imaging cameras were used by TMC operators to supplement to CCTV cameras. Their extensive deployment on freeways inside the perimeter provided additional flexibility.
- There was a considerable difference between the confidence with which TMC operators could verify and manage incidents where CCTV coverage was available (predominantly, I-75 and I-85 inside the perimeter) and those where it was not (I-20, I-285 perimeter, and US-78).

3.3.4 Effectiveness of the Transit Surveillance Components

This section presents information on the effectiveness of the transit surveillance components.

The IT1 groupings covered were:

- Incident Management.
- Transit Management.

The non-IT1 grouping covered was:

- Olympic and Paralympic Games Transportation Operations.

3.3.4.1 Transit Surveillance Svstems and Resources

The transit surveillance components of the Advanced Passenger Transportation Systems (ARTS) are: Automatic Vehicle Location (AVL) and Automatic Train Control (ATC). (The APC component was not operational during the games.) These components directly access transit operational characteristics during periods of service. Each component has functions that can be used in transit surveillance to detect operational, service, and safety incidents. In addition to the AVL and ATC systems (which are used solely for transit purposes), MARTA made effective use of the CCTV camera system as a transit surveillance tool during the event period. The following discussion provides a summary of the findings related to the transit surveillance components.

Automatic Vehicle Location (AVL) System

The AVL system was completed approximately three weeks before the beginning of the Olympic Games. Based on BA&H observations at the MARTA TIC during the event period, bus dispatchers were using AVL to monitor and assist buses along the assigned routes. Icons identifying buses were activated on the monitors and were viewable along the designated bus routes. Bus dispatchers used this unique perspective to evaluate headways along bus routes to adjust service as required, through direct communications with the bus operators. The incident detection effectiveness of the AVL system on the overall fixed-route bus operation was not measurable during the games. Although bus dispatchers and operators received training on the use of this new system, further use and experience with the system will be required in order for them to derive its fuII potential as a transit security and audio monitoring tool. Observations of this system during the games indicated that the system offered significantly enhanced capabilities in the area of transit surveillance.

Train Control System

The train control system was operational as of April 1996. After a period of shakedown during May and June, it was fully implemented throughout the games. The effectiveness of the train control system as a transit surveillance component was assessed during the event period. Observations of the train control system at the MARTA Rail central control facility at Avondale demonstrated that it was an effective tool for identifying and resolving potential rail incidents.

The central control facility has two large mosaic control boards located directly in front of the controllers' workstations. The mosaic board on the left side is the Train

Control Display; on the right is the Supervisory and Control Display. Train movements along the guideway and at the stations on both the Northeast/North/South and East/ West lines can be monitored from this display. The Supervisory and Control Display provides a complete view of the electrical power supplied to the guideway along the third rail, as well as the functional status of components, such as elevators, escalators, and CCTV cameras, within the stations.

Operations along the rail network are recorded for all hours of operation for each day of the week. This technology allows for the graphical and audio playback of any incident that has occurred during the past 30 days, with archive access for incidents that occurred beyond the 30-day period. This feature was demonstrated during the observation period for an incident that occurred on a previous event day. The playback feature displayed the operations of a train between two stations, including the speed of the train, time of operation, exact times when the stations were entered and exited, and the closed or opened positions of the doors while the station was being accessed.

CCTV Cameras

Transit incidents were primarily identified through radio communications from the bus operators of the OSTS bus fleet. Radio calls were received by Spectator Communications radio dispatchers, covering the type and location of the incident. If the location was on the freeway network or at an entrance and exit ramp, it was correlated with the camera closest to the incident, and a request was made to the MARTA TIC to access that camera. The MARTA TIC then called that camera from the ITS workstation and transmitted the view to Spectator Communications. Radio dispatchers were then able to view the incident while they provided directions on how to respond. The CCTV cameras provided a new and unique perspective to transit surveillance, as well as to assistance with incident response actions, and they proved to be extremely valuable during the event period.

MARTA TIC also made extensive use of the CCTV cameras on the Georgia Dome to help assign buses and manage spectator movements.

In summary, the findings of the data analysis regarding this component of the Event Study were as follows:

- The incident detection effectiveness of the AVL system on the overall fixed-route bus operation was not measurable during the games. Although bus dispatchers and bus operators received training on the use of this new system, further use and experience with the system will be required in order for them to derive its full potential as a transit security and audio monitoring tool. Observations of this system during the games indicated that the system offered significantly enhanced capabilities in the area of transit surveillance.

- Observations of the train control system at the MARTA Rail central control facility at Avondale demonstrated that it was an effective tool for identifying and resolving potential rail incidents.
- The CCTV cameras provided a new and unique perspective to transit surveillance, as well as to assistance with incident response actions, and they proved to be extremely valuable during the event period.
- MARTA TIC also made extensive use of the CCTV cameras on the Georgia Dome to help assign buses and manage spectator movements.

3.3.5 Utility of the ATIS Components

The utility of ATIS components is discussed in Section 3.5.5. The ITI grouping covered was the Regional Multimodal Traveler Information.

3.3.6 Utility of the APTS Components

The utility of the ARTS components is discussed in Section 3.5.5. The IT1 groupings covered were:

- Incident Management.
- **Transit Management.**
- Regional Multimodal Traveler Information.
- Electronic **Fare Payment.**

The non-ITI groupings covered were:

- Olympic and Paralympic Games Transportation Operations.
- Other Infrastructure.

3.3.7 Impact of the HOV Facilities

The traveling public was surveyed during the Olympic and Paralympic Games to assess their perceptions of the HOV lane system. only those who resided in the Atlanta area and had driven on the region's freeways prior to the games were asked to respond to questions about the HOV lane system. This was intended to ensure that they understood the difference between pregames conditions and games conditions.

The ITI groupings covered were:

- Freeway Management.

- Incident Management.
- Transit Management.

The non-ITI groupings covered were:

- Olympic and Paralympic Games Transportation Operations.
- Other Infrastructure.

HOV lane traveler attitude surveys were conducted during the Olympic and Paralympic Games. One hundred and thirty responses were gathered, with the following results:

- 68 percent had used HOV lanes before the Olympics.
- 25 percent had used HOV lanes during the Olympics.
- 85 percent believed HOV lanes were "not very" congested.
- 65 percent believed HOV lanes were a good way to encourage carpooling.
- 87 percent had observed very few violators, if any, unless general-purpose lanes were highly congested, or there had been an accident.

The **130** surveys indicate the perception of a cross-section of users and are not necessarily indicative of the entire region. With the population of the metropolitan area approaching three million, these findings must be interpreted with caution. The **findings are indicative only.**

The traveler perceptions of HOV-lane operations are aligned with actual HOV-lane operations. In Atlanta, these lanes are typically uncongested unless there is an incident blocking traffic in the general-purpose lanes. During incidents on general-purpose lanes, it is not uncommon for violators to be found in the HOV lane. The survey **indicated that HOV-lane** operations during the Olympic Games was very similar to normal day-to-day operations.

It was observed that traffic conditions during the Olympic Games limited the potential for travel time-savings using HOV lanes. Although recurrent congestion was regularly observed most afternoons on the southbound I-75/1-85 connector, particularly after the first week of the Olympic Games, HOV lanes did not offer noticeably faster speeds than general-purpose lanes. Indeed, the convergence of the HOV lanes on the southbound I-75 and I-85 connector was causing the HOV lane to be as congested as the adjacent general-purpose lanes in that vicinity.

It was expected that OTS buses would rely heavily on the HOV lane network during the games. However, buses were frequently observed (by CCTV camera feeds in the

TMC) to be using general-purpose lanes, even when an HOV lane was available. Two possible explanations for this are:

- Speed governors on some of the OSTS buses were set to 104.65 km/h or less, while general traffic moved at speeds frequently in excess of 104.65 km/h during uncongested traffic conditions.
- The number of interchanges with dedicated HOV lane entry/exit ramps may have limited the attractiveness of the HOV lanes. This affected all OSTS buses on routes from Park & Ride lots to the Olympic Ring, because the lots were located north of Atlanta, in the I-75, I-85, and GA400 corridors.

The only interchange with dedicated HOV lane entry/exit ramps that could have been used by OSTS shuttle buses serving these Park & Ride lots was Williams Street. However, because of concerns about possible conflicts with Olympic Family buses in the Williams Street area, ACOG routed these buses via the I-75/1-85 connector to Martin Luther King Jr. Drive, via a general-purpose interchange on the south side of the CBD. Not only was the selected route longer, it also meant that OSTS buses had to pass through one of the most congested sections of freeway. This decision meant that, on a southbound trip, in addition to weaving across up to six general-purpose lanes to access the HOV lane, OSTS bus operators had to make the reverse maneuver to exit the freeway. Bus operators are known to have been uncomfortable with these maneuvers.

BA&H observers noted that, on some sections of freeway, the left shoulder adjacent to the HOV lanes was narrow or nonexistent It was noted on CCTV camera views that, in locations with narrow left shoulders, stalled vehicles sometimes partially blocked the adjacent HOV lane. If the option existed, TMC planning operators posted a warning message on an upstream HOV lane CMS. It was understood that, to implement HOV lanes for the Olympic Games, the design exception process, including risk analyses and associated mitigation (HERO vehicles, CMS, video detection, and surveillance), was completed by GDOT and FHWA.

In summary, the findings of the data analysis for this element of the Event Study were as follows:

- Almost two-thirds of local freeway users believed HOV lanes were a good way to encourage carpooling.
- GDOT was prepared to take measures to encourage the use of HOV lanes.
- An operational decision by ACOG contributed to a lost opportunity for OSTS buses to use HOV lanes in conjunction with a dedicated access ramp.
- Some bus operators were reluctant to use the HOV lanes, because of the difficulty of making multiple merge/weave maneuvers across general travel lanes.

- Overall, the HOV lanes had a neutral impact on transportation operations during the games, because they did not offer noticeably faster speeds than general-purpose lanes.
- To implement HOV lanes for the Olympic Games, the design exception process, including risk analyses and associated mitigation (HERO vehicles, CMS, video detection, and surveillance), was completed by GDOT and FHWA.

3.3.8 Impact of the North Line Rail Extension

In this evaluation, the ITI grouping covered was:

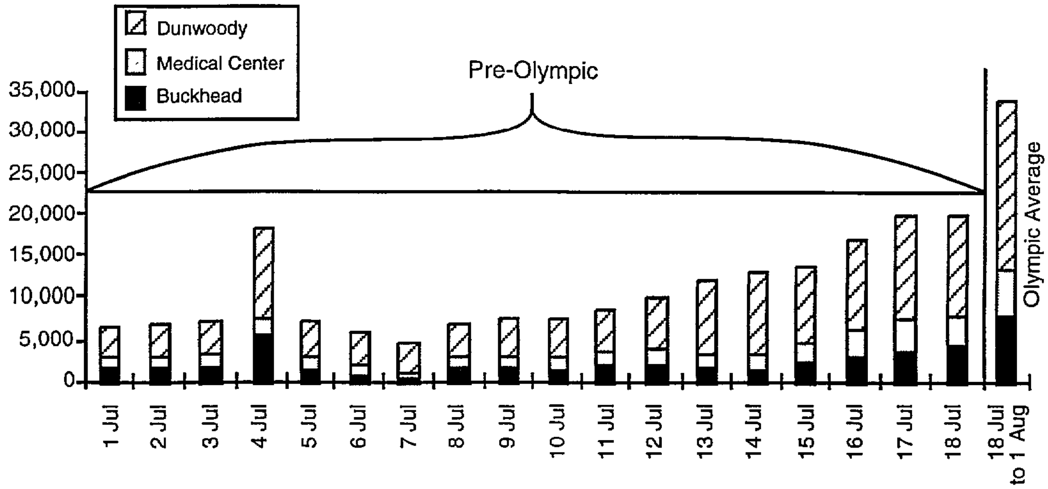
- Transit Management.

The non-IT1 groupings covered were:

- Olympic and Paralympic Games Transportation Operations.
- Travel Demand Management.
- Other Infrastructure.

The MARTA North Line Rail Extension opened on June 8,1996, with service from Dunwoody Station to the existing Lindbergh Center Station on the North / South line. The smooth operation of the North Line Extension was made possible by the new train control system. The system it replaced was already operating at capacity and prevented any further upgrades to the rail system. Two of the three new stations (Dunwoody and Medical Center) provided approximately 922 extra parking spaces for improved motorist access to the rail system. With the opening of this extension, MARTA approximately doubled the throughput of trains traveling from Lindbergh Center Station through Five Points Station and beyond.

Figure 3-9 presents the average daily ridership experienced on the North Line Extension from July 1 through July 18, compared to the average daily ridership during the Olympic Games. Figure 3-8 must be interpreted with some caution, as ridership on the North Line Extension may not have settled to any base level so soon after opening. No information is available to determine whether riders on the North Line Extension were attracted from the Northeast line, MARTA fixed-route bus service, or automobiles, or whether they represented newly induced demand generated by the extension.



Source: MARTA

FIGURE 3-9. North Line Ridership—Unlinked Passenger Trips, by Station

Unlinked passenger trips along the North Line Extension averaged approximately 8,379 from July 1 through July 10 (including July 4), with heavy ridership on July 4 most likely due to holiday events. From July 11, however, ridership on the North Line Extension increased on a daily basis until it reached a pre-games high of 20,131 unlinked passenger trips on July 18, one day prior to the Olympic Games opening ceremonies. This represented an increase of 140 percent compared to the first part of July, before the games started. This increase could have been due to a number factors, including:

- The gradual increase in Olympic Games volunteer staff preparing for the approaching games period.
- Motorists transferring to rail.
- Pregames visitors traveling to such locations as Centennial Olympic Park.

As previously stated, MARTA Rail experienced average daily ridership about five times above normal levels during the Olympic Games, and the same was true for the North Line Extension, as illustrated in Figure 3-9. The last bar in Figure 3-8 represents the average daily unlinked passenger trips on the North Line Extension during the Olympic Games. The North Line Extension carried an average of 34,258 unlinked passenger trips each day during the Olympic Games, which was more than four times the average daily ridership of 8,379 from July 1 through July 10.

The North Line Extension played an important role in MARTA's ability to support OSTS operations and regular MARTA customers during the games. The North Line Extension, with its three new stations, provided new access points to MARTA Rail, which helped increase its accessibility. Without the North Line Extension, spectators and regular passengers would have had to access MARTA Rail at other rail stations along the North/South line. The North Line Extension approximately doubled the throughput of trains traveling from Lindbergh Center Station through Five Points and beyond. While a similar capacity increase may have been realized by operating the Northeast line trains with shorter headways, the North Line Extension helped considerably with the huge crowds and unprecedented rail ridership experienced during the Olympic Games.

In summary, the findings of the data analysis regarding this element of the Event Study were as follows:

- The North Line Extension played an important role in MARTA's ability to support OSTS operations and regular MARTA customers. The North Line Extension, with its three new stations, provided new access points to MARTA Rail, which helped to increase its accessibility.
- The North Line Extension carried an average of 34,258 unlinked passenger trips each day during the Olympic Games, which is more than four times the average daily ridership from July 1 through July 10.
- Rail ridership just before the games had increased by 140 percent compared to the first part of July.
- The North Line Extension approximately doubled the throughput of trains traveling from Lindbergh Center Station through Five Points and beyond. While a similar capacity increase may have been realized by operating the Northeast **Line** trains with shorter headways, the North Line Extension helped considerably with the huge crowds and unprecedented rail ridership experienced during the Olympic Games.

3.3.9 Performance of Freight Movement Plans Developed for the Olympic Games Period

The performance of freight movement plans is discussed in Section 3.5.5. The non-ITl groupings covered were:

- Olympic and Paralympic Games Transportation Operations.
- Travel Demand Management.

3.4 INSTITUTIONAL IMPACTS

Institutional impacts are categorized into three areas: organization, operational coordination, and legal issues. The IT1 groupings covered were:

- Freeway Management.
- Incident Management.

- Transit Management.
- Regional Multimodal Traveler Information.
- Traffic Signal Control.

The non-IT1 grouping covered was:

- Olympic and Paralympic Games Transportation Operations.

3.4.1 Organization: Mission and Roles

The Olympic and Paralympic Games required extensive interagency coordination to plan and operate the transportation system. Some agencies had not previously participated together in such coordinated operations on such an intense scale. Also, since ACOG and APOC were formed solely for the Olympic and Paralympic Games, these agencies had also not previously coordinated with any Atlanta area agencies.

At the post-games workshop held in September 1996, an exercise was conducted to identify each agency's overall mission or goal and their transportation role during the games. Each agency's transportation role was clearly integrated into the overall Olympic or Paralympic Games transportation operating plan. However, the mission or goal of each agency was potentially in conflict with that plan.

The mission of ACOG was to "put on a successful Olympic Games," with part of that success measured as the amount of money remaining when the games were over. While "putting on a successful Olympic Games" did not conflict with operating a successful transportation system, the financial goal did.

All of the transportation agencies are concerned with managing their funds in a responsible, efficient manner. However, public agencies are not charged with making a profit as part of their mission statements. They are primarily concerned with the safe and efficient movement of people and goods under their jurisdiction. They are also concerned with their long-term image in the Atlanta region.

It is also important to note that the definition of a successful Olympic Games included many other considerations besides transportation. ACOG was concerned with the athletic events: preparing the stadiums, selling tickets, recruiting sponsors, providing for the media, and handling a variety of other needs. Whereas ACOG was a multi-objective agency, the transportation agencies were not (at least not to the same extent). The internal conflicts of the multiobjective ACOG organization could spill over to affect the ability of the transportation agencies to coordinate with it. For example, ACOG put off signing leases on Park & Ride lots until a few months before the games, in the hope that the cost to lease them would go down. This greatly hampered the ability to plan for the OSTS, including estimating the number of buses needed and planning the routes. This ultimately meant that there was not enough time to have an on-street practice exercise.

While it was clear that the agencies' individual roles fit into an integrated transportation plan, it was also noted that no agency was responsible for integrating the multiple modes into a unified whole. In addition, planning and operations for some modes and mode transfers were not taken on by any agency. For example, there were several locations where heavy pedestrian flows conflicted with OSTS shuttle bus movements. However, no agency was responsible for ensuring the efficient movement of spectator buses, as well as the efficient and safe movement of pedestrians, including spectators. The potential for these types of gaps in the transportation system could have been overcome with good interagency cooperation and joint planning prior to the start of the games.

In summary, the findings of this data analysis were as follows:

- The mission of ACOG was to "put on a successful Olympic Games." Whereas ACOG was a multiobjective agency, the transportation agencies were not (at least not to the same extent).
- ACOG put off signing leases on Park & Ride lots until a few months before the games, in the hope that the lease costs would go down. This greatly hampered the ability to plan for the OSTS, including estimating the number of buses needed and planning the routes.
- There were several locations where heavy pedestrian flows conflicted with OSTS shuttle bus movements. However, no agency was responsible for ensuring the efficient movement of spectator buses as well as the efficient and safe movement of pedestrians, including spectators.

3.4.2 Operational Coordination

Because of the limited functionality of the TCCs and, to a lesser extent, MARTA TIC, operators in those centers were mostly unfamiliar with the capabilities of the ATMS. There had been little opportunity for any new pattern of interagency operational coordination to develop. In any event, most agencies were so preoccupied with last-minute preparations for the games, there was only limited opportunity for the level of "team building" required to achieve the full benefit of the ATMS. Operational coordination had been examined in three areas: communications, training, and incident management.

3.4.2.1 Communications

While some communication between the agencies was observed during the games, the overall picture indicated that these depended as much on personal relationships as on any formal procedures. The following are examples of the types of communication that took place.

Accident on the Northbound I-85

This incident was discussed in Section 3.3.1.5. The incident involved a tanker loaded with bulk cement and a truck carrying a mobile home. It was probably the most significant freeway incident during the games, in terms of the types of vehicles involved, traffic disruption caused, and incident clearance resources required. It was also significant because it highlighted the mixed status of communications among the agencies involved. On a positive note:

- Neighboring counties investigated the possibility of a freeway diversion.
- The local Police Department (PD) contacted MARTA regarding reroutes for regular MARTA buses on surface streets.
- MARTA TIC maintained contact with ATOC regarding any possible impact on spectator arrivals or departures for events.

However:

- The **local** PD elected to recover the ditched cement tanker immediately, without consulting the local TCC, GDOT, or the Command Table, causing heavy traffic congestion.
- The **local TCC** staff noted that communications with the local PD were **historically poor;** the local PD was unaware of the TCC's access to cameras, and **the local** PD did not participate in pregames traffic meetings.
- No communication took place between MARTA TIC and TMC during the incident.
- There were no direct communications between TMC (or ATOC) and the local PD.

While the I-85 incident highlighted specific communications issues in the county concerned, it also demonstrated the lack of communications between the TMC and the local PD, and **between the** TMC and MARTA TIC.

MARTAf-TMC

MARTA TIC has the ability to transmit and receive communications with the TMC through a direct phone line installed in the TIC communications room. However, this communications link was seldom used, due to unfamiliarity by the MARTA TIC and TMC in coordinating with each other.

BA&H observers noted no direct contact made between TMC operators and MARTA TIC operators. Under nongames conditions, this may have been understandable, because of the relatively small interface between scheduled MARTA bus service and the freeway system. However, during the Olympic Games, MARTA's operational management role on behalf of ACOG for the OSTS bus operations meant there was a considerable presence of buses on the freeway system. While communications between MARTA and the ACOG TransOps 1 (ACOG's transportation operations command located at the TMC was called TransOps 1) in TMC did occur, direct communications between TMC operators and MARTA TIC operators would have resulted in much mutual benefit during the games.

The need for coordination was highlighted in the first few days of the Olympic Games. Several stalled vehicles blocking the HOV lane were observed. One incident, tracked by TMC operators, was not reported to MARTA TIC for more than 20 min, and only then by a bus operator using his in-vehicle radio. The reverse situation was also noted, where a stalled bus blocked the HOV lane for more than 30 min before TMC operators detected it on CCTV. The stalled bus had been in radio contact with MARTA TIC from the outset.

All MARTA Buses and OSTS buses had radio contact with MARTA TIC. This represented an enormous potential for expanding the incident detection network across the metropolitan area, particularly as MARTA TIC supervisors were keen to work with TMC to maximize system utility.

MARTA/APD

The lines of communication between MARTA TIC and ATOC were unclear during **the Olympic** Games, although the need for communication was clear, based on incidents that occurred. MARTA TIC periodically required ATOC assistance throughout the Olympic Games, but followed communications procedures developed with APD over previous years.

An example was an incident that occurred during the second week of the Olympic Games at Martin Luther King Street and Spring Street. OSTS buses were having difficulty negotiating the turn onto Martin Luther King Street, due to a traffic signal that could not accommodate the capacity of buses and other vehicles attempting to turn at this intersection. Radio communications from bus operators to MARTA TIC indicated that approximately 18 buses were backed up from Fulton Street and prior to Martin Luther King Street. The Chief of Radio Communications called personal contacts in APD to obtain assistance to adjust the traffic signal. In response to this call, APD dispatched two police officers on motorcycles to assist with traffic operations at this intersection. Once the police officers arrived at the intersection, they did not have the authority or capability to make any adjustments to the traffic signal and could only assist by directing traffic manually. The delays at this intersection continued throughout the Olympic Games, and the traffic signal was not addressed by ATOC.

It is not known whether ATOC could have made any adjustments to the traffic signal during the Olympic Games. However, it was clear that the line of communication between MARTA TIC and ATOC was not well-defined with respect to incident response measures. MARTA TIC believed that ATOC had the ability to make adjustments to the traffic signal to alleviate the poor flow of OSTS buses through the intersection. Observations in the MARTA TIC and the SSCCC indicated that communications only existed between MARTA TIC and APD based on previous personal working relationships. The communication from MARTA TIC to TMC and then to ATOC for traffic operation incident response was not well-defined, leading to a poor response to the traffic signal incident.

MARTA/ACOG TRANSOPS

MARTA followed the procedures developed during the planning stages and practiced at the table-top sessions, when they phoned in information on successive days regarding signals they believed to be faulty. The information was radioed to the **ACOG** representative at the TMC (TransOps 1). However, no reply was provided to MARTA. MARTA could have rerouted their buses to avoid the malfunctioning traffic signal if they had information regarding when a police officer **would** arrive to direct traffic or when the signal operation would be corrected.

APOC

One event that illustrates the importance **of personal relationships versus** interagency agreements was observed during **the Paralympic** Games. **Before the** Paralympic Games began, APOC transportation staff met with the Atlanta PD to agree on street closures and other traffic restrictions. One restriction discussed was the potential **closure** of one **lane** on a street adjacent to the Olympic Stadium, to facilitate athlete bus movements. It was agreed that the condition would be evaluated during the opening ceremony, since the need for and impact **of the closure** would depend on the level of traffic volumes circulating around the stadium, as well as the arrival rate of the athlete buses.

On the night of the opening ceremony, the arrival rate of APOC athlete buses was much faster than was expected. The athlete buses were queuing in the traffic lane, and it was hoped that the athletes could be unloaded onto the traffic lane to speed the process. The APOC Transportation Manager at the stadium requested the police officer on the street **to close the traffic** lane. The police officer knew nothing of the agreement and refused. The Atlanta TCC was contacted, as this was where the city of Atlanta Police Major was said to be located. However, the Atlanta TCC was found to be unmanned. An APOC transportation volunteer working at the TMC had monitored the radio communication regarding the lane closure. This volunteer had more than 30 year's experience at GDOT, with much of his work involving coordination with a Major in the Atlanta PD. By chance, the APOC volunteer found the Major at the TMC. Within a few minutes of their meeting, the police officer on the street had initiated the closure.

There was a breakdown in the procedures in that the Atlanta TCC was unmanned and there was no clear way to contact the Major. It was only by chance that the Major was found at the TMC. In addition, the Major had not been directly involved in the Paralympic Games transportation plan. His trust in a long-term working partner made the decision to order the closure an easy one for him.

GDOT/City of Atlanta

The city of Atlanta and GDOT combined forces to field local action teams responsible for implementing traffic signal timing changes in the field, when needed. Many changes to on-street traffic movement restrictions were made once the Olympic Games began, to facilitate traffic flow and reduce the number of manually controlled intersections.

TCC CCTV Camera Control

The full capabilities of the ATMS were not online, especially at the TCCs, during the games. Despite the lack of a fully functional IMS system, operators at the TCCs with camera viewing functionality were regularly observed calling in incidents to the TMC. In effect, they substituted the phone for the IMS. No response to these communications was provided.

In summary, the findings of the data analysis for this element of the Event Study were as follows:

- While the I-85 incident highlighted specific communications issues in the local county, **it** also demonstrated the lack of communication between the TMC and the local PD, and between the TMC and MARTA TIC.
- MARTA TIC had the ability to transmit and receive communications with the TMC through a direct phone line installed in the TIC communications room. However, this communications link was seldom used, due to unfamiliarity by the MARTA TIC and TMC in coordinating with each other.
- All MARTA Buses and OSTS buses had radio contact with MARTA TIC. This represented an enormous potential for expanding the incident detection network across the metropolitan area, particularly as MARTA TIC supervisors were keen to work with TMC to maximize system utility.
- MARTA followed the procedures developed during the planning stages and practiced at the table-top sessions. Information was radioed to the ACOG representative at the TMC (TransOps l), but no response was provided to MARTA.
- There was a breakdown in procedure when the Atlanta TCC was unmanned and there was no clear way to contact the Police Major during an isolated event during the Paralympics.

- The city of Atlanta and GDOT combined forces to field local action teams responsible for implementing traffic signal timing changes in the field when needed.
- TCC operators with camera viewing functionality were regularly observed calling in incidents to the TMC. In effect, they substituted the phone for the IMS.

3.4.2.2 Training

Training is an important part of the learning process for interagency coordination. It presents the opportunity for operators from the various centers to obtain practical knowledge about using ATMS and, more importantly, on how other centers use or plan to use the system. This process of mutual understanding will contribute towards maximizing the overall benefit of the system.

A lack of complete training was noted by both TMC operators and supervisors. Some of the training was provided before the system came online. Thus, it was more of a lecture than a "hands-on" experience. The operators could not immediately go to their work stations and try out some of the things they learned. Some of their learning was lost in the period between the training and the time the system came online. Much of what was learned (i.e., their real training) was done on the job during the Olympic Games. Both supervisors and operators commented that more training was needed.

Similarly, all the TCC personnel felt that the training was welcome but not adequate, and that it would have been more helpful if given when the system was up and running. The CCTV camera **control software** was easy to use and the operators learned quickly. **MARTA** TIC supervisors received training at the TMC in a one-day class. Training was brief, and staff learned how to access and maneuver CCTV cameras through trial and error at the **MARTA TIC.** More training was expected at some point in the future.

It was evident that the staff at all the centers considered that the training received was inadequate for their needs. Also, no training was given regarding the different ways each center planned to use the system, perhaps because of the focus on the games and the lack of full functionality in all centers.

With respect to planning for operations during the games, a number of exercises took place:

- Approximately 18 mo before the games, GDOT operations staff met with other GDOT staff, including planning and electrical departments, for **a** GDOT table-top exercise.

- ARC and the Department of Defense developed a series of scenarios to provide direction as to which agency should assume a lead role, to give guidance on appropriate responses, and to provide necessary information for coordinating responses. Participating agencies included:
  - FHWA
  - ACOG
  - GDOT
  - MARTA
  - City of Atlanta
  - APD
  - Atlanta Fire Department
  - SOLEC
  - GEMA

- The following exercises were conducted:
  - Table-top exercise in January 1996.
  - Table-top exercise in March 1996.
  - Command post exercise in April 1996.
  - ACOG operations exercise in June 1996.

- MARTA/FTA organized a series of table-top exercises and field trials to assess the levels of readiness of MARTA and OSTS, as follows:
  - FTA safety and security table-top exercise in February 1996.
  - ACOG communications exercise in April 1996.
  - Stone Mountain Archery Trials shuttle operations in April 1996.
  - Wolf Creek Shooting Event in April 1996.
  - ACOG communications exercise in May 1996.
  - U.S. Track and Field Team Trials shuttle operations in June 1996.
  - HOV lane test in June 1996.
  - ACOG operations exercise in June 1996.
  - Olympic Games opening ceremony dress rehearsal in July 1996.

Perhaps because of the lack of full functionality in all centers, no multiagency planning exercises on using the ATMS took place.

In summary:

- It is evident that staff at all centers consider that training received to date is inadequate for their needs. Perhaps because of the focus on the games, and the lack of full functionality in all centers, no training was given regarding the different ways each center planned to use the system.
- With respect to planning for operations during the games, a number of planning exercises are known to have taken place at GDOT, ARC, and MARTA. Perhaps

because of the lack of full functionality in all centers, no multi-agency planning exercises took place on using the ATMS.

3.4.2.3 Incident Management

The full benefit of ATMS may not be achieved without a new interagency approach to freeway incident management. Such an approach must involve operations staff, including those in the TMC, MARTA TIC, and TCCs, and staff involved in on-scene management, such as GDOT HEROs, police officers from all enforcement agencies, and other emergency services personnel.

There is an initiative by ARC for a new interagency approach to freeway incident management. ARC passed a resolution in 1991, establishing a freeway incident management program and task force. The task force formed four action teams, addressing:

- Incident management handbook/laws and regulations.
- Contract wrecker services/service patrols.
- Communications.
- Public awareness/promotional activities.

The incident management handbook is being jointly developed by ARC and GDOT. Although implementation was suspended in 1995 during the build-up for the games, the handbook is close to finalization and is expected to be published in the near future. **Implementation** of such **an approach,** in conjunction with corresponding training, will **greatly** improve interagency coordination during major incidents.

3.4.3 Legal Issues: Interagency Agreements

Agreements **are** yet to be developed regarding GDOT control of non-GDOT signals for incident management during times when TCCs are not staffed. Some of the agencies feel that GDOT **will not** have adequate information about their systems and transportation networks to retime signals. Others do not have this issue.

GDOT District 7 has developed a handbook of diversion plans, which details diversion setups for blockages on any section of the metropolitan freeway network. However, these diversion plans are not embedded in the IMS, nor are they approved by affected agencies.

3.5 AGENCY AND USER PERCEPTIONS

The perceptions of travelers and other end-users are important to developing a complete assessment of transportation systems. The following sections document the perceptions of the TMC, MARTA TIC, and TCC operators and supervisors, other agency personnel involved in the OTS, and the traveling public.

3.5.1 **Operator** and **Supervisor Perceptions of System Performance**

Supervisors and operators were interviewed to assess their impressions of the usefulness and performance of the ATMS. The interviews were conducted twice, once during the first week of the Olympic Games, and once during the final days of the Olympic Games or just after. Any changes in perceptions and experience were documented. Since the systems were brought online just prior to the games, such changes might have been due to technical improvement during shakedown, or the effects of gaining more experience on the system.

The following subsections summarize the key comments and information gathered from operator and supervisor interviews regarding the technical, operational, and institutional issues. It is noted that the operators and supervisors were working long hours on a system that was very new to them. Because the system was so new, the Olympic Games period amounted to the "shakedown" testing period. In addition, several features of the system were not online during the Olympic Games period. Therefore, they were most apt to report on things that did not work well, rather than those that did, especially in the first interview.

The ITI groupings covered were:

- **Freeway Management.**
- Incident **Management.**
- **Transit** Management.
- Regional Multimodal Traveler Information.
- Traffic Signal Control.

The non-ITI groupings covered were:

- Olympic and Paralympic Games Transportation Operations.
- Travel Demand Management.

3.5.1.1 GDOT TMC

The ATMS functions in place at or available to the TMC at the beginning of the Olympic Games included CCTV camera control and image availability, CCTV images from city of Atlanta cameras, IMS functioning, and CMS message posting capability. In addition, the TMC dispatched maintenance crews, contract wreckers, and GDOT HERO's as needed to respond to freeway incidents.

GDOT's incident management role changed from a passive to an active role with the introduction of the HEROs and the TMC. In the past, prior to the implementation of the ATMS, GDOT monitored incidents as they were communicated to GDOT, keeping manual incident logs. Wreckers were dispatched by the individual police dispatch units. GDOT was responsible for forwarding information to the units when a wrecker was needed. The TMC operators had a much more active role in all phases of incident management. They were responsible for incident detection on the area's freeways through CCTV images or GDOT HERO reports (in addition to other methods, such as *DOT calls or police information). They could help manage incidents by dispatching police, District 7 maintenance crews, contract wreckers, or GDOT HEROs. They could also assist motorists by posting appropriate messages on the CMSs, and they monitored incidents to determine when CMS messages should be changed or cleared.

The TMC staff were generally enthusiastic about the new capabilities the ATMS provided. They were most pleased with the capabilities provided by the CCTV cameras, which they perceived had drastically improved the time to verify incidents. One operator estimated that verification used to take about 30 min and now usually takes no more than 5 min. The TMC operators also monitored activities involving GDOT HEROs, helping to ensure the HERO driver's safety. The TMC operators were also generally very pleased with the IMS software, but suggested several improvements.

No new operators were recruited for the TMC. The operators that had formerly been responsible for the "paper tracking system" were trained to operate the ATMS. The operators had to be trained not only in the use of the ATMS, but also in their new responsibilities for detecting, managing, and tracking incidents using the ATMS tools. One area that was particularly difficult for operators to learn was the method and criteria for confirming incidents.

The lack of complete training was noted by both operators and supervisors. Some of the training was provided before the system came online. Thus, it was more of a "lecture" rather than a "hands-on" experience. The operators could not immediately go to their work stations and try out some of the things they learned. Some of their learning was lost in the period between the training and the time the system came online. Much of what was learned was "on the job" during the Olympic Games. Both supervisors and operators commented that more training was needed.

However, because the user interfaces were generally very understandable and simple to use, the operators were able to function fairly well. Their speed improved noticeably as their experience grew over the four-week observation period. However, two areas were pointed out as difficult to use. First, the operators found it difficult and time-consuming to place incident icons. Second, the full library of incident response plans was not known to all of the operators at the beginning of the Olympic Games. During the games, the contractor helped the operators learn more about the incident response library. After the games, the operators continued to improve their skills and to learn how to use the full range of options provided by the ATMS software.

A major frustration was the frequent system crashes. The contractor was able to work out many of the problems, particularly those that caused the system to go off-line for extended periods. The system continues to be prone to crashes. These types of problems are typical during a shakedown period. It was unfortunate that the system shakedown coincided with the Olympic Games.

Relationships with other agencies, 911 operators, police agencies, and the city of Atlanta in particular, were improved with the planning and implementation of the ATMS system.

Several suggestions for system improvement were proposed in the interviews following the Olympic Games. Many of these improvements have already been implemented.

- Posting of construction activities to the IMS has been limited from all activities statewide to just those that affect the metropolitan area. This has greatly reduced the clutter on the X-wall (the large display screen in the TMC control room), which simplifies incident tracking.
- Incidents involving stalls or debris spills that do not affect travel lanes are no longer automatically posted.
- The software should be modified so that icons can be removed without removing the incident from the system. This would help when major incidents are moved to the shoulder and the incident continues to be tracked, but the response plan (e.g., CMS message to motorists) is greatly modified.
- Informational meetings and tours should be held at the TMC to inform the agencies connected with TMC operations (the TCC agencies, police, 911, fire, GSP, etc.) and to build relationships with other agencies' personnel.

In summary, the findings of this element of the Event Study were:

- TMC staff were most pleased with the capabilities provided by the CCTV cameras, which they perceived had drastically improved the time needed to verify incidents. They were also very pleased with the IMS software, but suggested several improvements.
- Much of what was learned about using ATMS was "on the job" during the Olympic Games. TMC supervisors and operators commented that more training was needed.
- During the Olympic Games, TMC operators needed assistance to learn more about the incident response library. After the games, the operators continued to

improve their skills and to learn how to use the full range of options provided by the ATMS software.

- It was unfortunate that the system shakedown coincided with the Olympic Games.
- Relationships with other agencies, in particular 911 operators, police agencies, and the city of Atlanta, were improved with the planning and implementation of the ATMS system.
- The software should be modified so that icons can be removed without removing the incident from the system. This would help when major incidents are moved to the shoulder and the incident continues to be tracked, but the response plan (e.g., CMS message to motorists) is greatly modified.

3.5.1.2 City and County TCCs

The TCC operators and supervisors at Clayton, Cobb, De Kalb, Fulton and Gwinnett Counties and at the city of Atlanta were interviewed both before the Olympic Games and in late October 1996. When the games began, all of the TCCs had the capability of controlling their own cameras (if they had any). All but Cobb County could also access GDOT's CCTV cameras. No change to this functionality was reported after the games.

Participating in incident management was a role that the TCCs had not previously taken on. This new role and the new capabilities presented with the ATMS instigated changes to each of their organizations. At a minimum, existing staff were trained to take on new functions. At some TCCs, new staff positions were also created, although many of these positions remain unfilled or were not funded until recently. At others, organizational changes took place, creating a separate TCC organization, including signal maintenance dispatch. Staffing and organizational changes usually required county or city council approval.

TCC and TIC staff were very pleased to be participating in a regional incident management program, and were very happy to have any new tools, such as CCTVs, to assist them in daily traffic management. At two TCCs, the operators took an active role in monitoring traffic conditions on their own and GDOT's facilities using the cameras, and they often called in situations to the TMC. De Kalb County participated in monitoring and managing a major incident using their cameras.

As at the TMC, the TCC personnel felt that the training was welcome but not adequate, and that it would have been more helpful if given when the system was up and running. The camera control software was easy to use and operators learned it quickly.

The TCCs also suffered system crashes, although it was not clear if the source of the crash was the TMC or themselves. The city of Atlanta suffered frequent crashes when trying to add traffic signals to the system, and they abandoned their automated signal control system for the duration of the Olympic Games. Again, this illustrated the difficulties that occurred during system shakedown.

The city and the counties all noted that in the past they had coordinated individually with each other or GDOT for special projects. However, since the introduction of the ATMS, coordination involving all the agencies was much more active, including meetings at ARC or technical meetings at GDOT. Many expressed the feeling that their input to the selection of the traffic signal control system component of the system had not been fully considered.

Most of the signal controllers in the counties are NEMA with NEMA system control software. Atlanta and GDOT use 170 controllers and the software supports those 170 controllers. The counties have installed secondary PCs, connected to the ATMS, to control their signals. Agreements have yet to be developed regarding GDOT control of non-GDOT signals for incident management during times when TCCs are not staffed. Some of the agencies feel that GDOT would not have adequate information about their systems and transportation networks to retime signals. Others do not have this issue.

Several suggestions were made by the TCC personnel for system improvement:

- An agreement should be developed for common operating and maintenance procedures, and on standardization of equipment.
- Remote laptop accessibility to the TCCs should be provided so that on-call personnel can address some signal problems from their homes.
- Closer communication with local 911 operations should be provided.
- Interagency meetings should be recommended.

In summary, the findings of this element of the Event Study were:

- TCC staff were very pleased to be participating in a regional incident management program, and were very happy to have any new tools, such as CCTVs, to assist them in daily traffic management.
- TCC personnel felt that the training was welcome but not adequate, and that it would have been more helpful if given when the system was up and running. The camera control software was easy to use and the operators learned it quickly.
- The city of Atlanta abandoned their automated signal control system for the duration of the Olympic Games, because of frequent system crashes when they tried to add traffic signals to the system. This illustrated the difficulties that can occur during system shakedown.
- Since the introduction of the ATMS, coordination involving the city and the counties has been much more active, including meetings at ARC or technical

meetings at GDOT. Many have expressed the feeling that their input to the selection of the traffic signal control system component of the system was not fully considered by GDOT.

- Agreements have yet to be developed regarding GDOT control of non-GDOT signals for incident management during times when TCCs are not staffed.

3.5.1.3 MARTA

The ATMS and APTS functions in place at MARTA at the beginning of the Olympic Games included CCTV image access, IMS functioning, and the MARTA Rail train control system. The AVL component was operational for vehicle monitoring, but could not be accessed for route adherence functions. The ATIS Itinerary Planning component became operational during the second week of the Olympic Games, but it lacked full capability to transmit data back to the transit customer via telephone or fax. MARTA TIC connectivity to the IMS software was operational at the beginning of the event period, but it then became inaccessible due to a software change implemented by the TMC. In addition, the MARTA TIC dispatched maintenance crews and contract wreckers as needed to respond to transit incidents.

The agency staff interviewed included operators and supervisors in the MARTA TIC who were operating the AVL system, IMS software, and CCTV cameras. The MARTA Bus operators were interviewed onboard their vehicles for AVL components during revenue hours, and Customer Service staff responsible for operation of the ATIS Itinerary Planning System were also interviewed. Agency staff in the MARTA Rail Central Control Center were interviewed to evaluate the recently installed Train Control System. Interviews with these staff were conducted during working hours after coordination with supervisory personnel. Bus operators were interviewed on Route 5 as they stopped at Lindbergh Station to pick up and deliver passengers. The results of these interviews were summarized by type of staff.

AVL

The AVL system was primarily utilized by radio dispatchers in the MARTA TIC to monitor buses as they traveled along their assigned routes. The dispatchers indicated that the AVL system was an effective addition to their communications center, due to three key factors:

- The ability to monitor and adjust bus service levels.
- The ability to monitor the mechanical functions of the vehicles.
- The ability to monitor the safety of the operator and the passengers onboard.

In addition, they felt that an opportunity existed to coordinate with the city of Atlanta to access the APD when emergency situations were identified by the AVL system. The AVL system could track vehicles to their exact street locations and could assist police with locating vehicles that required emergency assistance due to crime or other violence. The staff indicated that the system worked well but was frequently off-line due to system failures resulting from its recent installation. Recommendations for improvement from the MARTA TIC staff included more channels to operate AVL and access at all of the dispatcher tables.

The bus operators interviewed indicated that they were aware of the recent installation of the AVL system but had not utilized it to any significant extent during everyday operations. They stated that they had received training on the capabilities of the AVL system and the operation of the system from the vehicle. Discussions with AVL supervisors confirmed that the AVL system was not being utilized by the bus operators because the system was experiencing startup difficulties and was not completely operational. Overall, bus operators provided positive feedback about the potential uses of AVL. They were enthusiastic about its ability to assist with their personal safety via the onboard microphone that allows the radio dispatchers to monitor onboard conversations during emergency situations. This was the only AVL feature available to bus operators during the games.

PARIS

PARIS became operational during the second week of the Olympic Games and was operated by MARTA Customer Service operators who previously relied on hard copies of maps and **route** schedules to assist passengers with route planning. Customer Service operators indicated that PARTS was extremely useful in assisting passengers with their travel plans, because it eliminated the need for physically accessing a map of the region and the bus routes that served it. In addition, the system had the ability to prioritize routing information from "most" to "least" effective. For example, when a customer called in and asked for the transit route from Chamblee to Avondale, PARIS prioritized the best path via **transit** modes such as rail or bus. Operators indicated that when the system was online and not undergoing troubleshooting, they used it about 85 percent to 90 percent of the time to assist passengers. They felt that the system would save significant time because, **once** a travel path was identified, the system could automatically relay the information to the passenger through its recorded message or fax system, allowing the operator to assist another incoming call. Recommendations for improvement included: faster processing of the mapping video system on the monitor, and fewer layers of maps. Overall, the perceptions of operators and supervisors regarding the use of PARIS was positive, and all respondents expressed enthusiasm and interest in utilizing the full potential of this system once it is completely installed.

MARTA Train Control System

The train control system was operated primarily by train controllers at the MARTA Rail Central Control Center, **to** maneuver trains along the guideway and ensure safe operation along the guideway. Train controller staff indicated that the new system was extremely effective, with few problems experienced since startup operations in April 1996. They stated that the new system enabled them to accommodate the North Line Extension, which operated throughout the event period. The staff stated that the new system had several innovative features, such as workstations with built-in graphics and an animator system that recorded incidents and provided playback within 30 days of their occurrence in a format similar to a TV video cassette. Other stated benefits of the new system included user interface that emulated the prior functional keyboard with graphics interface, and the ability to access the system at any train controller's workstation.

CCTV and IMS

MARTA TIC supervisors received a one-day training class; the staff learned how to access and maneuver CCTV cameras through trial and error at MARTA TIC. (More training is expected at some point in the future.) The CCTV cameras were primarily operated by the Chief of Radio Cornrnunications in the MARTA TIC. The IMS incident reporting system was operated by one of MARTA's information system staff. The Chief of Radio Communications indicated that the CCTV camera system was extremely useful in locating and identifying vehicles that were broken down or involved in accidents while in service. Observations in the MARTA TIC indicated that staff members were very interested in the use of the CCTV cameras as a tool to monitor vehicles assigned to their service region, although their stations did not have access to those cameras.

The staff indicated that the IMS system could be an effective tool in identifying incidents that are reported by bus operators as they travel along their routes. Information System staff stated that buses could act as probes, identifying other incidents that could then be transmitted to the TMC through the IMS system. Observations during the beginning of the event period identified staff entering incidents into IMS that were detected by transit operations; however, it was unclear whether these incidents were received by TMC. Overall, staff in the MARTA TIC indicated that they were unclear about the lines of communication with the TMC regarding the use of the IMS system. Staff indicated that CCTV cameras could be effective tools in resolving transit and roadway incidents, but more communication was necessary with the TMC and other TCCs to benefit fully from these systems.

In summary, the findings of this element of the Event Study were:

- Radio dispatchers in the MARTA TIC indicated that the AVL system was an effective addition to their communications center, due to three key factors:
  - The ability to monitor and adjust bus service levels.
  - The ability to monitor the mechanical functions of the vehicle.
  - The ability to monitor the safety of the operator and the passengers onboard.

- Dispatchers felt that an opportunity existed to coordinate with the city of Atlanta to access the APD when emergency situations were identified by the AVL system.
- The staff indicated that AVL worked well but was frequently off-line due to system failures, attributable to its recent installation.
- The AVL system was not utilized by the bus operators because the system was experiencing startup difficulties and was not completely operational.
- Bus operators provided positive feedback about the potential uses of AVL and were enthusiastic about its ability to assist with their personal safety.
- The perceptions of operators and supervisors was positive regarding the use of PARIS. All respondents expressed enthusiasm and interest in utilizing the full potential of this system once it is completely installed.
- Staff indicated that the new train control system was extremely effective, with few problems experienced since startup in April 1996.
- MARTA TIC supervisors received training at the TMC in the form of a one-day class. Staff learned how to access and maneuver CCTV cameras through trial **and** error at MARTA TIC.
- The Chief of Radio Communications indicated that the CCTV camera system was extremely useful in locating and identifying vehicles that were broken down or in accidents while providing transit service.
- Observations during the beginning of the event period identified staff entering incidents into IMS that were detected by transit operations, however, it was unclear whether these incidents were received by TMC.
- Staff within the MARTA TIC indicated that they were unclear on lines of communication with the TMC regarding use of the IMS system.
- Staff indicated that CCTV cameras could be effective tools in resolving transit **and** roadway incidents, but more communication was necessary with the TMC and other TCCs to fully benefit from the system.

3.5.2 Perceived Effectiveness of Olympic Travel Demand Management Plans

This section reviews travel demand forecasting and its relationship to TDM, and discusses the TDM plans for the Olympic Games, covering commute options and freight fleet management. Although the commute options plan for the Atlanta metropolitan area remained in effect after the Olympic Games, no specific TDM plans were developed for the Paralympic Games. Therefore, the TDM analysis focuses only on the Olympic Games.

The ITI groupings covered were:

* Transit Management.
* Regional Multimodal Traveler Information.

The non-IT1 groupings covered were:

* Olympic and Paralympic Games Transportation Operations.
* Travel Demand Management.

3.5.2.1 Travel Demand Forecasts

The OTIS model was the basis for travel demand forecasting. The assumptions used to estimate the Olympic Games modal travel demand forecasts were very complex and comprehensive, and included:

- Venue locations, expected number of tickets to be sold, percent of tickets expected to be used.
- Scheduled event start and end times.
- Expected Olympic Family travel demands, including volunteer travel demands, mode splits by rail, auto and volunteer bus, and auto occupancy.
- TDM-induced reductions in MARTA Rail ridership (by an expected 10 percent) during the games (commuter trips only, not including spectators).
- Expected stayovers: those who attended events but did not immediately return to their origin following the event. The percentage of stayovers depended on the opportunities for attending subsequent events at each venue, other adjacent attractions, and the number of people arriving early or lingering near a venue to enjoy the Olympic Games atmosphere.
- Expected hangers-on: those who used the OSTS to access a venue area, but did not hold tickets. They may have gone to other attractions like Centennial Park or simply enjoy the Olympic Games atmosphere. The number of hangers-on was estimated by venue, as a percentage of the venue attendance, and was dependent on the opportunity to visit nongames attractions nearby.
- Expected arrival and departure time distribution.
- Expected origins, based on ACOG provided hotel distributions and local area housing data (from the census).
- Expected spectator mode split and average vehicle occupancy. The mode split varied by venue and origin / destination locations.

The capacity of the OSTS was based on:

- Expected rail headways and crush loads.
- Number of available rail cars.
- Park & Ride lot locations, bus headways, and capacity loads.
- Number of available spectator buses.

The OTIS daily rail demand forecast for the Olympic Games was added to the estimated baseline rail passenger demand, yielding the total rail demand. The OTIS daily bus demand forecast for the Olympic Games was assumed to be accommodated completely by the OSTS shuttle bus or Olympic Family systems. Thus, no trips were added to MARTA Bus base loads.

The OTIS daily auto forecasts were not assigned to the road network because OTIS did not have that capability. The expected traffic demands were based on the projected numbers of vehicles estimated to be arriving or departing a venue area. These were general estimates and were not assigned to specific routes.

After the Olympic Games, it was estimated that traffic volumes on the roadway system had been somewhat lower than expected, were about what was expected on the OSTS shuttle buses, and were significantly higher than expected on MARTA Rail. This demonstrated that it was very difficult to predict travel behavior in a situation like the Olympic Games-

The rail volumes were higher than expected. (Section 2.6 of this report summarizes travel demand statistics during the Olympic Games.) On average, MARTA Rail daily ridership was measured at approximately 0.9 million unlinked passenger trips, and occasionally reached nearly 1.2 million. Actual ridership may have been higher since, during crush load periods, some passengers with Olympic tickets did not pass through the turnstiles used for measurement. MARTA planned for a maximum daily rail ridership of around 0.75 million, which reflected the capacity of the network. With an actual demand level occasionally exceeding that expected by up to 0.45 million, some operating changes were necessitated during the first week of the games:

- Extra staff were brought in for crowd control measures on platforms, to keep riders clear of the doors to enable trains to leave the station safely, and to maintain headways.
- More crowd control at surface levels was needed than had been planned.
- Passenger staging had to be conducted at several downtown stations since the stations could not hold all the demand, and queues formed outside these stations.

With the benefit of hindsight, the travel demand forecasts have been analyzed to assess the impact of individual assumptions or factors on the reliability of rail ridership forecasts. While it is not possible to quantify which of these had the greatest influence, the following attempts to estimate their relative impacts, and serves to provide an understanding of how these assumptions or factors may have contributed to the final outcome:

1. Shortly before the Olympic Games, a large number of tickets (approximately 750,000) that had been provided to Olympic Games sponsors were returned unused to ACOG, which in turn sold them to the general public. Those sponsors were to have been transported on the Olympic Family fleet. Since the tickets were sold to the public, additional demands were placed on the OSTS, including rail. Averaged over the 17 days of the Olympic Games, this added up to 50,000 spectators each day on the OSTS. Assuming three-quarters of these were for venues within the Olympic Ring, and assuming all spectators traveled by rail, this may have added some 75,000 unlinked rail passenger trips per day.
2. ARC believes that the number of hangers-on was also underestimated, (e.g., the Olympic Ring estimate was 30 percent of spectators). More people traveled to events and attractions during the Olympic Games than those who attended sporting events. These probably included local residents, athletes, and tourists traveling to: Centennial Olympic Park, local museums, hotels and other facilities to visit out-of-town guests, shopping, and other attractions. While the actual number of spectators traveling by car was unknown, using an approximation of 400,000 total daily visitors to the Olympic Ring and a 50 percent estimate of hangers-on (instead of 30 percent) may have added some 160,000 unlinked rail passenger trips per day.
3. There was no specific provision for additional travel by Olympic Games ticket holders beyond that assumed for “stayovers.” MARTA transit services were free to ticket holders on the day of the ticket. This created an incentive for ticket holders to ride MARTA. Many spectators held tickets for morning or evening events, potentially doubling the estimated number of trips assumed for any ticket holder. This travel did not depend on nearby attractions. For example, a spectator could travel in the morning to an out-of-town venue, such as Stone Mountain, returning in the afternoon to go to downtown Atlanta. No estimates were available for these trips.
4. Up to 50,000 volunteer workers for ACOG were expected to use several Park & Ride lots to transfer to Olympic Family fleet buses for transport to their venues. ARC believes the use of these Park & Ride lots turned out to be lower than expected, with many volunteers using rail. If each volunteer on average made one daily round trip by rail, this may have added some 100,000 unlinked rail passenger trips per day.
5. It was assumed that MARTA Rail baseline figures would be reduced by 10 percent due to the effects of the TDM program. However, based on the TDM focus group results and ARC’s survey of firms’ TDM programs, one of the most widely used strategies to reduce vehicle traffic was transfer to rail. While part of

this increase may have been due to volunteer and other games-related travel, a modal shift from car to rail was also highly likely. Evidence from the North Line Extension supports the view that such a transfer may have occurred. As discussed earlier in this report, the regional modal split for commute trips was 81 percent for the single-occupant vehicle and 4 percent for bus and rail. A transfer of only a few percent of single-occupant vehicle drivers may have added some 200,000 unlinked rail passenger trips per day.

6. The assumptions for many venues included charter buses as a possible mode. It was assumed that the charter buses would park at Park and Ride lots and transfer their passengers to the OSTS shuttle buses. However, ACOG charged $50 per charter bus for access to the Park & Ride lots, and charter buses were not allowed to access venues. Because of these factors, many charter buses dropped their passengers at MARTA Rail stations. While the exact number of charter buses was not known, it was understood to be in excess of 1,000 vehicles. Assuming 50 passengers per vehicle, each making one round trip per day by rail, this may have added some 100,000 unlinked rail passenger trips per day.

7. The proportion of spectators traveling by car to the venue sites was assumed to be 15 percent for the Olympic Ring venues. While the actual number of spectators traveling by car was unknown, using an approximation of 400,000 total daily visitors to the Olympic Ring and an average vehicle occupancy of three persons, some 20,000 cars per day would have been involved. Based on observations of the number of cars parked in the Olympic Ring, it is believed that the **15** percent car mode assumption was high. Despite there being no parking spaces at venues, and despite many surface lots being turned over to nonparking uses, the parking garage immediately adjacent to the CourtIand Street ramp to the downtown area was frequently observed to be substantially empty, even though regular parking charges were in force. If two-thirds of the people assumed to travel by car used rail instead, this may have added some 80,000 inlinked rail passenger trips per day.

This discussion outlines seven assumptions or factors that may each have contributed to the lower-than-observed rail forecast. Each assumption or factor is estimated to have had an impact in the range of 75,000 to 200,000 unlinked passenger trips per day. Taken in isolation, no single factor would probably have had much impact on how OSTS was operated. When combined, however, these factors exceeded the apparent shortfall in travel demand forecasts for rail ridership. The actual impact of each factor cannot be quantified; it is possible that each may have had a much larger or smaller impact. Indeed, it is not the purpose of this analysis to focus on the difference between actual and forecast demand, but to highlight the fact that forecasting is an inexact science, which depends as much on the interpretation of the outputs as on the outputs themselves. The major conclusion that can be drawn from this analysis is that, as with any modeling exercise, understanding the sensitivity of the forecasts to the assumptions on which they are based is essential. In addition, when a complex model relies on a large number of assumptions, the sum of several seemingly small errors can produce a very large aggregate error.

In summary, the findings of this element of the Event Study were:

- On average, MARTA Rail daily ridership was measured at approximately 0.9 million unlinked passenger trips, and occasionally reached nearly 1.2 million. MARTA planned around an expected daily ridership of 0.75 million, on Day 10 of the Olympic Games.
- With an actual demand level occasionally exceeding that expected, by up to 0.45 million, some rail operating changes were inevitable during the first week of the games.
- Seven assumptions or factors that may each have contributed to the lower-than-observed rail forecast were explored, although the actual impact of each assumption or factor could be quantified.
- Forecasting is an inexact science, which depends as much on the interpretation of outputs as on the outputs themselves, in this case, bus, rail, and vehicle volumes. Understanding the sensitivity of the forecasts to the assumptions on which they are based is essential.

3.5.2.2 Travel Reduction Achievements Due to the Commute Options Plan and Its Effectiveness During: the Events

As described in Section 2.6, GDOT is preparing a report documenting the daily freeway traffic flows observed during the Olympic Games. The initial findings indicate that:

- Daily traffic volumes on I-75, I-85, and I-20 were 4 to 6 percent less than typical flows.
- Daily volumes on I-285 were 4 to 11 percent greater than typical flows.
- The I-75/1-85 connector daily volumes were about the same **as** usual.
- Peak periods were more spread out in time, and occurred earlier than usual.

It is not possible to describe the actual shifts in traffic flow that were realized due to changes in baseline traffic. For example, although it appears that traffic on the freeways inside the perimeter was shifted to the perimeter, this is only one scenario that might have occurred. Another scenario could have been that overall baseline traffic volumes were lower during the Olympic Games, and that Olympic-related traffic caused increases on the perimeter and made up for any reductions on the connector. However, because we know there was added traffic due to the Olympic Games, we can conclude that overall baseline volumes were reduced during the Olympic Games. This reduction and the shifted “spread-out peak period” can both be attributed to the effects of the TDM plan.

To understand better the types of TDM strategies used, a focus group was held on September 5, 1996, attended by a number of local public and private-sector organizations (all with 100+ employees) that had implemented TDM plans for employees during the Olympic Games. ARC was also present. TDM plans comprised a variety of strategies, such as flex-time working, carpooling, vanpooling, working from home (telecommuting), and riding transit services. Organizations represented at the focus group included:

- Amresco.
- CIGNA.
- Coca-Cola.
- Environmental Protection Agency (EPA).
- King and Spalding.
- Government Service Administration (GSA).

The TDM measures and strategies implemented are shown in Table 3-17.

TABLE 3-17. Summary of TDM Plans for the Olympic Games Period

Measure/ Strategy	Amresco	CIGNA	Coca-Cola	EPA	GSA	King and Spalding
Vacation	Not encouraged	Not encouraged	Not encouraged	Not encouraged	Not encouraged, but many took vacation to volunteer for the Games.	Not encouraged
Change in work hours-compressed work week	Compressed work week and flexible 2-1/2-hour time "bank"	Flextime allowed	Office hours 6:00 a.m. to 3:30 p.m.	Office opened at 5:00 a.m. and closed at 4:00 p.m.	Yes	Opened at 7:00 a.m.
Restricted parking	No	No	Yes	No	No	No
Rent space outside perimeter	No	No	No	No	Yes—for Social Security Admin. only	No
Work only on out-of-town assignments	No	Yes	No	Yes	Yes—for many agencies	No
Telecommute-work at home	Yes	Yes	No	Yes	Yes	Yes
Transit subsidy	Yes—100%	Yes—100%	Yes—100%	No	No	No
Assistance with child care	LWOP allowed for child care	No	Yes	No	No	No—little interest
Provide meals at work	Yes	Yes	No	No	No	No
Subscribe to Harmon Bros. Downtown Employees Shuttle Service (DESS)	Yes—100%	No	Yes	No	No	Yes—subsidized $90 of $190 per-person cost
Carpool (in addition to any baseline carpool program)	No	Tried to use ARC ridematch, but only one match came up.	No	Yes	Yes	Tried an electronic bulletin board ridematch system—minimal interest

Source: TDM focus group organized by Booz-Allen & Hamilton

Even though the general perception of local agency staff was that many workers went on vacation during the Olympic Games, the focus group indicated that vacation time was not encouraged. Reductions in traffic volumes were most likely due to flex-time and telecommuting, which were the strategies most often cited in the focus group.

The focus group discussion illuminated some key points about implementing a TDM program for the Olympic Games, including:

- The preplanning meetings held by ACOG were very helpful in getting the word out early to be prepared for heavy traffic volumes.
- The support provided by Commute Connections Network (CCN) was good, although in some cases it was not timely enough. CCN did not have much time (only about 4 or 5 months) to devote to assisting firms with TDM planning, so it was natural that some information was sent too late for some firms to use.
- The spirit of the Olympic Games was a key motivator for private businesses to implement a temporary TDM plan. They indicated that they would be unlikely to pursue long-term TDM plans unless it was mandated, or if it affected their profitability. They mentioned many hurdles to implementing TDM, including equity issues both within individual offices and between offices in multioffice firms, and difficulties that employees had with child care. Also, they felt that many of their employees were unwilling to use transit due to an uncertainty regarding how to use buses or rail, race and status issues, and the perception that MARTA transit was slower than driving.
- The public agencies were motivated by the Clean Air Act Amendments of 1990 and the mission statements made by Vice President Gore earlier. Thus, they saw the Olympic Games as an opportunity to accelerate any TDM efforts they had already planned or implemented.

In summary, the findings of the TDM effectiveness analysis were:

- The ACOG media campaign (done in conjunction with ARC), which cautioned the public of the potential for gridlock, was very successful in affecting the necessary "discretionary" travel changes. One piece of supporting evidence that the media campaign worked to reduce traffic relates to travel behavior as the Olympic Games progressed. Because there were no major traffic tie-ups at the onset of the Olympic Games, many travelers realized that traffic congestion was not as bad as had been expected. This was broadcast on the radio, and television and printed in the newspapers. As the games progressed, more people appeared to be choosing to drive downtown, based on the understanding that traffic was relatively light. To mitigate the growing traffic volumes, ACOG and GDOT reissued the request that everyone avoid driving near the CBD.
- Travelers responded to the media campaign either directly or as a consequence of the TDM plan. Freeway trip-making was spread to different times of the day

and/or reduced by a significant amount. Many commuters turned to MARTA, or simply stayed away from the Atlanta CBD.

3.5.2.3 Effectiveness of the Freight Fleet Management Plan During the Events

To assess the effectiveness of the freight management plan, interviews were conducted with representatives from UPS, Federal Express, CSX Transportation, the Norfolk and Southern Railroad, GATX, ARC, ACOG, GSP, and APD. On an ad-hoc basis, businesses located within the Olympic Ring were also queried regarding freight operations during the games. The following summarizes the main findings from these interviews. Expanded interview summaries are included in Appendix C.

ARC, ACOG, and APD Views

ARC led the freight planning for the Olympic Games, in partnership with ACOG. They were very pleased with the success of the TDM freight management plan, and believed that much of the success was attributable to the many meetings and forums held with local carriers, businesses, and the Georgia Motor Trucking Association, ARC believed that the permitting and venue accreditation process could have been handled better. Major Woodard of the APD agreed. Many local carriers did not understand the security and transportation restrictions in place for the games. ARC and APD were flooded with calls and requests for information the week before the games. Because there was not enough time to process permits for all those needing them, APD chose to rely on officer discretion to allow trucks into restricted areas. Major Woodard said that there was a high level of compliance, and no citations or warnings were issued during the games.

UPS and Federal Express Views

Managing package pickup and delivery for UPS or Federal Express was a major logistical undertaking. UPS provided the most detailed comments regarding their operations. As a worldwide Olympics sponsor, some of their experiences and perceptions may have been different from others, since they had such close access to Olympic Games information. For example, UPS knew of additional street closures put in place after the Olympic Centennial Park bombing, before any other delivery services were informed. It was not clear how they got this information, but they are sure it was because they had access to internal Olympic security and venue management channels. As a sponsor, they were also less sensitive to added costs from Olympic Games operations.

Changes to UPS's normal operations included:

- Shifting all deliveries within the Olympic Ring to between 12 a.m. and 6 a.m., per the Olympic Ring restrictions.
- Consolidating their 150 "parking positions" (locations where drivers could park on-street while they did pickups and deliveries) to 16 off-street positions.
- Training four additional part-time drivers to augment their normal staff. This was required because DOT rules limited the length of driver shifts, and the shifts were constrained by the 12 a.m. to 7 a.m. delivery window within the Olympic Ring.
- Developing a cadre of personnel who were on-call for positions within the Olympic Ring, to serve as walkers, delivering and picking up packages on foot. However, the traffic conditions were not severe enough to warrant their use, and they were not deployed.
- Shifting dispatch to the period of 5:00 to 5:30 a.m. from their normal 8:00 to 8:30 a.m.
- Installing drop-off centers for air pickup at key locations, such as the media mall.

Atlanta is a major transfer and consolidation hub for UPS. Their corporate headquarters is located in Atlanta. They operate three hubs in the area, all located outside the perimeter.

Olympic Games shipments were separated from all others for security and efficiency. UPS was accredited by ACOG to deliver to venues in advance of the games. (Other carriers had to deliver to material transfer areas to be screened for security purposes.) They were able to maintain all of their normal hub operations, yet they did have a contingency plan in which staff were available to be added if necessary; the extra staff were not needed.

Air traffic was shifted to make landings earlier and departures later, again due to the time restrictions in the Olympic Ring. Because these operations did not occur during peak airport times, changes were easy to implement. UPS did not need to bid for peak slots.

Ups also participated in a demonstration project with the FAA and the Atlanta Vertical Flight Association to test the viability of helicopters for high-value or highly perishable package pickup and delivery during highly congested periods. Even though there was minimal congestion, the service was used by several banks and hospitals, who helped fund the test along with UPS and the FAA. Overall, the test was considered successful and valuable.

UPS' volumes surged in June, just before the games. Overall volumes during the games period also increased over base loads, but the normal volumes were down. The increase was due solely to Olympic Games related shipments.

UPS believes that customers were impressed with the service UPS provided during the Olympic Games. They had a lot of staff available, and they were able to serve all requests.

One comment for improvement was offered. It would have been helpful to finalize the details of the Olympic Ring closures and other traffic restrictions sooner than was done, to allow more time to prepare for the special operations.

Federal Express (FedEx) implemented similar operational changes as did UPS. Their package sorting operations, dispatch, and flight times were all adjusted to meet the Olympic Ring time restrictions. FedEx installed devices at 400 drop-box locations to detect how full each box was and to schedule pickup accordingly. These devices were particularly useful at drop boxes located at hotels, which filled much faster than usual. Overall, Federal Express did not feel they were subject to any undue expenses or disruption to comply with the Olympic Games needs. They were pleased to be part of a successful Olympic Games.

CSX, Norfolk Southern, and GATX Views

CSX and Norfolk Southern are railroads that operate intermodal yards within the city of Atlanta. GATX is one of the largest long-haul trucking firms in the Southeast.

Rail operations suffered only minor disruption due to the Olympic Games. In anticipation of heavy vehicle and pedestrian traffic, CSX posted extra security personnel at key at-grade rail crossings to ensure safe operations. It also rerouted many trains around the city, to reduce the potential for conflicts and disruption to rail operations. Rail schedules and intermodal yard operations were shifted to late night and early morning hours, as well. CSX did not believe the extra costs were unreasonable.

Norfolk Southern also experienced little disruption to operations. It rerouted any trains containing hazardous materials around the city, as requested by SOLEC, and yard schedules were changed to allow for early morning arrivals. Rail schedules were not changed. Its intermodal/piggyback operations experienced a surge of activity in June, just before the games, which almost exceeded their manpower capacity. Business was down slightly during the games.

Although there were some costs to complying with the plan, Norfolk Southern did not find them excessive. Unexpected disruptions occurred to Norfolk Southern operations on those portions of their track that parallel MARTA Rail routes whenever MARTA was investigating a potential bomb threat on the parallel route. Norfolk Southern responded by holding back trains from traveling on these portions of track.

GATX sent an Olympic Games package to all of their customers, including advice regarding complying with freight restrictions. Most of their customers followed the recommendations and stockpiled supplies and curbed needs during the games. To ensure minimal disruption to its intermodal operations, all GATX truck/rail operations were moved to the Norfolk Southern yard, which was more remote to the Olympic Ring than the CSX yards.

CSX, GATX, and Norfolk Southern all noted that they were "better safe than sorry" regarding the precautions and planning they did for the Olympic Games.

In summary, the findings for this portion of the Event Study were:

- The truck and rail industry was pleased with the outcome.
- All carriers interviewed subscribed to the view that they were "better safe than sorry" in planning for the games.
- Extra costs to operate during the games were not unbearable.
- Freight trains were delayed when MARTA, operating on adjacent tracks, received bomb threats or scares.
- UPS and FedEx changed flight arrival and departure times to comply with restrictions.
- The success of the TDM plan contributed to successful freight operations. It is not clear how weIl freight movements would have operated if higher levels of congestion had occurred. The contingency plans developed by UPS would likely have worked well, particularly the concept of walking packages around in the Olympic Ring area.

3.5.3 ACOG and APOC Venue Transportation Managers' Perceptions of the Olympic Travel Demand Management Plan: Venue Notebooks

Access to the ACOG Venue Transportation Managers (VTMs) was not provided. Perceptions of the utility of the venue notebooks are based on a review of the notebooks themselves, as well as information provided at the workshop held on September 6, 1996. Several agency personnel who attended the workshop had volunteered as both Olympic and Paralympic Games VTMs, and provided comments regarding venue operations. The Olympic Games VTMs were too busy to be interviewed, both during and after the games. Their availability was also constrained because their contracts were up within one week of the games ending. A meeting was scheduled with four Olympic Games VTMs, but none attended.

The ITI grouping covered was:

- Transit Management.

The non-IT1 grouping covered was:

- Olympic and Paralympic Games Transportation Operations.

To help crews organize and operate the movement of vehicles and spectators, the venue notebooks contained detailed information on several aspects:

- Dates, times, and level of street closures near venues.
- Circulation for Olympic Family fleet.
- Spectators.
- VIPS.
- Freight.
- Emergency vehicles.
- Other traffic accessing the venues.
- Proposed signing plans to direct spectators to OSTS facilities.

The notebooks were dynamic tools that were updated as needed to meet on-site requirements.

In an interview with the APOC Assistant Transportation Manager, her opinion of the Paralympic Games venue notebooks was that they were invaluable. The most valuable piece was the map section that included the on-site circulation plans and detailed routes from venues to the athletes' village. It was noted that these maps should have been supplied to the bus operators, who got only written instructions. The information in the notebooks was best provided in a graphic format rather than in text or tables.

Comments and suggestions gathered at the workshop related to VTM personnel, communications, and operations, and were as follows:

Personnel (Comments and Suggestions from Post-Games Workshop)

- It was very difficult to estimate the number of people and hours required. This should be done early. Think about who must be paid, that is, who must be relied on. For example, volunteers should not be used for crowd control. Use only paid personnel. Volunteers are too unreliable and you may find yourself short-handed.
- Regarding paid personnel, make sure that the hierarchy of wages is fair, so that no tensions result between workers.

- Emphasize volunteer training, so that they do not provide incorrect information. Volunteers should be provided with a simple fact sheet.
- Train extensively on the use of radios. The radios have many capabilities that might go unused without proper training.
- ACOG sports staff were asked to work along side venue transportation personnel at the bus zones when the loading zones were very busy. This helped the sports staff understand transportation needs and work those needs into the venue training schedules.
- Beware of too many "hands in the pot." Have a clear distinction between the responsibilities of the Venue Managers and the Venue Transportation Managers.

Communications (Comments and Suggestions from **Post-Games Workshop)**

- The venue personnel are not the same as the venue transportation personnel, but should be provided with the same information. The public cannot tell the difference between them and will ask questions of any official-looking person.
- The Venue Managers and the Venue Transportation Managers should have a clear communications channel established between them.
- Have one piece of paper, updated as needed, with everyone's radio channel on it.
- Have enough radios and batteries.
- Use information from the cameras and the incident management system to communicate to the crowds at the venues. The crowds are more manageable when they understand why there is a delay.
- Camera coverage of MARTA loading zones would have been helpful. The Georgia Dome **cameras** were helpful in monitoring pedestrian flows at some venues.
- If necessary, recruit a knowledgeable rider on buses to assist unfamiliar drivers with navigation.
- Manage the expectations of management, spectators, and the public at large.

Operations (Comments and Suggestions from Post-Games **Workshop)**

- It takes more "real estate" to get from the bus to the venue than one might think. Consider the bus load / unload zones in the plan and provide ample room.
- For the Paralympic Games, consider separating wheelchair users and other disabled athletes from the rest of the contingent when queuing for the opening ceremonies. This might make things go more smoothly, but could be a sensitive issue.

- Also related to disabled athletes, it was noted that APOC successfully used lifts on athlete buses (rather than ramps). The fact that both the lifts and the buses were new helped reduce problems. Most problems were due to operator error, not equipment failure.

The Olympic Games VTMs successfully undertook a challenging bus loading, unloading, and dispatch request task. The crowds waiting for buses were larger than originally anticipated, for several reasons, including late changes to the spectator transportation plan, reductions in the number of buses available, bus breakdowns, and unfamiliar bus drivers getting lost. The actual number of spectators was more than the projections. If the background traffic volumes had been heavier, causing delays to bus operation, the crowds could have been even larger.

3.5.4 Perceptions of System Performance , from Agencies Involved

Many observations were made by delegates at a post-games workshop, held on September 6, 1996. The purpose of the workshop was to bring agencies together to review various aspects to transportation planning and management, and to understand better how the agencies coordinated with each other during the games. Thirteen agencies were represented:

* ACOG
* APD
* APOC
* ARC
* Clayton County
* Cobb County
* De Kalb County
* FHWA
* FTA
* GDOT
* Gwinnett County
* GSP
* MARTA
* SOLEC

The following agencies were invited but unable to attend:

- City of Atlanta (Department of Public Works - Transportation)
- Fulton County (Department of Public Works – Transportation)
- GEMA

The observations made by the delegates at the workshop are summarized in the following paragraphs. Some of the observations are based on success stories and some failures. All have value, particularly if they can ultimately be applied to other locations or events, The IT1 groupings covered were:

- Freeway Management.
- Transit Management.
- Regional Multimodal Traveler Information
- Traffic Signal Control.

The non-IT1 groupings covered were:

- Olympic and Paralympic Games Transportation Operations.
- Other Infrastructure.

3.5.4.1 Freeway Management

The value of the CCTV cameras was a recurring theme. Not only did cameras assist with traffic operations, they contributed to monitoring pedestrian flows too. The fact that more than one agency could view the same video image simultaneously was noted, as this enhanced interagency coordination. The suggestions made were as follows:

- Extend camera coverage to include passenger staging areas at venues.
- Make the blimp video image more widely available to TCCs.
- Use the information from CCTV cameras to provide information to spectators.

General comments were that it was necessary to build relationships before infrastructure.

Finally, microwave communications were found to be impaired during the games. It was believed that this was due to the impact of suddenly increased media transmissions.

3.5.4.2 Transit Management

The development of the OSTS organization as a separate entity of MARTA led to unexpected organizational difficulties, such as the lower priority of the transportation function within the ACOG organizational objectives. The organizational and physical separation of OSTS from MARTA also affected the level of transit operational culture exchange from MARTA Bus operational and management staff to the OSTS staff. MARTA Bus is one of the largest public transit bus systems in the country, with over 500 buses operated in peak service each day. MARTA Bus possesses a wealth of experience in bus transit operations and management, which could easily have been applied and transferred to the OSTS operating and management staff if MARTA had complete control of OSTS, including facility and staff resources. As a result, OSTS did not derive the maximum benefit from the relationship with MARTA Bus, and when the operational period of the Olympic Games began, the OSTS operating staff was somewhat constrained by its lack of direct transit experience.

OSTS lost the independence of the client/contractor relationship with ACOG and thereby received inconsistent direction and priorities from both MARTA and ACOG. At times, OSTS experienced delays with requests for resources from the ACOG organization, which diverted OSTS management attention from training exercises and readiness planning. For example, major resource requirements, such as buses, operators, garages, and Park & Ride lots, were not confirmed until just prior to the beginning of the Olympic Games. Perhaps ACOG should have developed the OSTS service plan to the full extent of the venue schedules and access plans, and then developed a complete turnkey contract with MARTA to complete the final operational aspects of the service plan and operate the OSTS services. This would have resolved the roles and responsibilities more clearly and forced the transition from planning into operations at a much earlier stage.

Greater consideration could have been given to the role of charter buses and other options for spectator transport, such as a midtown expressway system for buses, and bus lanes on surface streets.

More training of bus operators was needed close to the games, and should have included instructions on how to restart stalled vehicles.

The potential value of the AVL system for tracking vehicles was noted. The only buses to be fitted with AVL were selected MARTA Buses. No OSTS shuttle buses were equipped with AVL, in recognition of the difficulties of fitting out the loaned fleet. However, AVL could have assisted with some of the instances when vehicles became lost.

3.5.4.3 Regional Multimodal Traveler Information

Cable TV was the most heavily used of the different ATIS components. Interactive television was used more before and after the games than during. Kiosks had little impact on games travel, because they were not extensively implemented. However, they have a high potential for future applications as the public becomes more familiar with them and similar technologies. The usefulness of the kiosks could have been optimized through more consideration of location and setup arrangements. The Internet had a fairly limited level of use and was not particularly accessible to visitors. In-vehicle devices were well received, particularly by locals who were familiar with the alternative routes suggested.

3.5.4.4 Traffic Signal Control

Delegates considered that intersection control by police officers required a management approach that included background information to explain post instructions. Officers were then able to use their judgment in executing their duties, and to act in such as way as to meet objectives fully. Even if the management of police resources is the responsibility of the police departments, transportation planners should review resource needs versus availability to ensure they are matched.

In general, the permit process for parking and access was considered to be unnecessarily complex.

3.5.4.5 Olympic and Paralympic Games Operations

Conflicts existed between the needs of venue managers, transportation managers, and security requirements. The impact of security on transportation had the potential suddenly to render previously accessible locations as inaccessible.

Many of the transportation agencies received calls requesting information regarding general travel, freight movements, and Olympic Games venue schedules and ticket buying information, even though they did not have the information or even the correct number to call. Agency staff time was appropriated to answering a high volume of calls, particularly at ARC, that were outside their transportation role.

ACOG **was a** growing agency. As ACOG grew, personnel were transferred **throughout the available** office space, with phone numbers changing with the moves. This resulted in confusion to the public, especially when they were trying to follow up with ACOG on travel planning and events schedule related questions.

3.5.4.6 Other Infrastructure

It was noted that without the North Line Extension, MARTA could not have provided the service levels that it did provide during the Olympic Games.

3.4.5.7 Summary of Findings: Comments and Suggestions from Post-Games Workshop

- The value of the CCTV cameras was a recurring theme. Not only did cameras assist with traffic operations, they contributed to monitoring pedestrian flows.
- The development of the OSTS organization as a separate entity of **MARTA** and then its colocation within the ACOG offices led to unexpected organizational difficulties, such as the lower priority of the transportation function within the **ACOG** organizational objectives, the lack of transit operational culture exchange

from MARTA Bus staff to the OSTS staff, and the inability of ACOG to transition from their planning stage into the OSTS operational stage.

- Major resource requirements, such as buses, operators, garages, and Park & Ride lots, were not confirmed until shortly before the beginning of the Olympic Games, causing an inability to begin startup operations and testing of the OSTS system.
- OSTS derived limited benefit from the wealth of transit experience available from MARTA Bus, one of the nation's largest public transit bus operations.
- Cable TV was the most heavily used of the various ATIS components.
- Intersection control by police officers required a management approach that included providing background information to explain post instructions.
- Conflicts existed between the needs of venue managers, transportation managers, and security requirements. The impact of security on transportation had the potential suddenly to render previously accessible locations inaccessible.
- Many of the transportation agencies received calls requesting information regarding general travel, freight movements, and Olympic Games venue schedules and ticket buying, even though they did not have the information or even the correct number to call.
- Agency staff time was appropriated to answering a high volume of calls, particularly at ARC, that were outside their transportation role.
- ACOG was a growing agency. As ACOG grew, personnel were transferred throughout the available office space, with phone numbers changing with the moves. This resulted in confusion to the public when they attempted to contact ACOG on travel and schedule related issues.
- Without the North Line Extension, MARTA could not have provided the service levels that it did provide.

3.5.5 Perceptions of the Traveling Public on their Transportation Experiences During the Olympic and Paralympic Games

The traveling public was surveyed during the Olympic and Paralympic Games to assess their perceptions of the available ATIS and APTS components.

The IT1 groupings covered were:

- Freeway Management.
- Incident Management.
- Transit Management.
- Regional Multimodal Traveler Information.

- Traffic Signal Control.
- Electronic Fare Payment.

The non-IT1 groupings covered were:

- Olympic and Paralympic Games Transportation Operations.
- Travel Demand Management.
- Other Infrastructure.

3.5.5.1 ATIS Components

The ATIS comprised the following components:

- CMS.
- HAR (not operational during the games).
- TATS (not operational during the games).
- BBS (not operational during the games).
- Kiosks.
- ADAS in-vehicle navigation systems (not operational during the games).
- Atlanta TIS components.
  - Internet.
  - Cable TV.
  - Interactive TV.
  - In-vehicle navigation systems.
  - Personal communications devices.

Of the components that were operational, kiosks and Atlanta TIS are both subjects of separate detailed evaluations beyond the scope of the Event Study. However, overviews of these are provided in Section 3.5.5.3 and Appendix B, respectively.

During the Olympic and Paralympic Games, 137 local residents and visitors were asked: had they noticed the new CMSs, and HAR, whichpretrip planning tools had they used, and were they aware of the Internet site that posted real-time regional freeway traffic information. They were also asked how useful they found these systems. Their responses are summarized in Table 3-18.

TABLE 3-18. Traveler Survey Responses on Pretrip Planning Tools: Q: What Tools Did You Use to Help Plan Your Trip?

System	Percent Responding[1] Full Sample	Percent Responding[1] Locals Only	Percent Responding[1] Visitors Only	Usefulness[2] Full Sample
Radio	34	39	17	2.51
Newspaper	33	39	11	2.54
TV	32	38	22	2.18
Friends/Family advice	16	15	22	2.68
Information came with tickets	10	0	50	2.43
Local, didn't need information	7	9	0	N/A
Internet	1	1	0	2.00
Kiosk	0	0	0	N/A
Other, e.g., MARTA information, place of employment, and hotel help desk	22	24	17	2.67

Source: BA&H traveler surveys.
Notes: (1) Multiple responses were allowed.
(2) Usefulness was rated on a scale of 1 to 3, with 1 being not very useful, 2 being somewhat useful, and 3 very useful.

Since only 137 responses are considered and the population of the Atlanta metropolitan area is over 3 million, these findings must be interpreted with caution. The findings are indicative only.

As shown in Table 3-18, the print and broadcast media were the most widely used sources of pretrip planning information. The least used tools were the targeted media, such as Internet (1 percent of respondents) and traveler information kiosks (no respondents indicated they had used one). It is interesting to note that the highest perception of usefulness measured was friends and family advice. This is probably due in part to the amount of detail that can be imparted, and to the level of trust placed in the advice of family and friends.

The relatively low level of response to the use of the Internet site and the kiosks should be interpreted in the context of the amount of information available about them to general travelers. The *Atlanta Journal-Constitution* (AJC) provided an 8-page guide to the Olympic Games about two weeks before the games, and published daily updates. This information was available everywhere in Atlanta wherever newspapers were sold, with the special guide available free at many MARTA locations. The low level of actual Internet site users contrasts with the information that was available about the Internet

1 Atlanta has a morning paper, The *Atlanta Constitution,* and an afternoon paper, The *Atlanta JoumI. The* AJC is a combined edition. For the purposes of this report, AJC is used interchangeably to represent the local Atlanta newspapers.

site. Forty-five percent of the locals and 75 percent of the visitors responding claimed that they knew the Internet site existed.

Interpreting kiosk use should also be considered as indicative only, especially since there was no way to know if those responding to the interview had ever been anywhere near a kiosk location.

Table 3-19 summarizes the responses to questions on HAR and CMSs. Questions on HAR were excluded from the sample during the Paralympic Games because HAR was not in use at that time.

TABLE 3-19. Traveler Survey Responses on CMS and HAR

Question	Response					
	Full Sample		Locals		Visitors	
	Y	N	Y	N	Y	N
Did you see the HAR signs ?	40%	60%	41%	59%	37%	63%
Of those who saw the sign:						
Was the sign flashing?	23%	77%	27%	73%	0%	100%
If it was flashing, did you tune in?	40%	60%	40%	60%	n/a	n/a
If you tuned in, did you modify your route based on the information?	20%	80%	20%	80%	n/a	n/a
Did you see the CMS signs?	84%	16%	88%	12%	68%	32%
Of those who saw the sign:						
Was there a message?	80%	20%	80%	20%	85%	15%
If there was a message, were you able to read it?	86%	14%	85%	15%	92%	8%
If you read it, did you change your route based on the message?	26%	74%	26%	74%	27%	73%
	Usefulness (on a scale from 1 to 3)					
HAR	2.00		2.00		N/A	
CMS	2.51		2.51		2.54	

Source: BA&H Traveler Surveys

Notes: (7) Multiple responses were allowed.

(2) Usefulness was rated on a scale of 1 fo 3, with 1 being not very useful, 2 being somewhat useful and 3 very useful.

The results related to HAR may **be** skewed. The HAR system was not fully operational during either the Olympic or Paralympic Games. GDOT elected to stop using it early during the Olympic Games, because they could not receive verification at the TMC that the HAR advisory signs were flashing. Because the signs were not flashing, many people may not have remembered having seen them.

Some drivers may not have seen HAR signs or CMSs simply because the route they took had no such devices on it. It was also noted that locals were more likely than visitors to notice these devices. Visitors (drivers) often stated they did not see the signs, but their passengers did. This suggested that visitor drivers were focused on driving in an unfamiliar area, including navigating their route and taking in the roadway/freeway configuration.

Most locals and visitors indicated that they did not change their route based on any CMS information displayed. The messages most often displayed during the Olympic Games described temporary exit ramp closures, or advanced warning of traffic congestion/incidents.

The response to CMS was more positive than that for HAR. Again, this may have been a result of the HAR system being off-line; the sample could therefore be skewed. In general, drivers liked having as much information as possible, and found it very useful, even if they could not take alternative routes. A number of drivers complained of the sign placement, i.e., the sign gave congestion information when they were already stuck in the queue or backup.

In summary, the findings of this element of the Event Study were:

- The findings are indicative only, because of the relatively small sample size. The results **must be interpreted with caution.**
- Newspapers, and radio **and television reports were the most common sources of** pretrip planning information. These sources were also rated highly in terms of their usefulness to travelers.
- The press disseminated **important** travel information both before and during the games.
- The traveling public appreciated the information provided on the CMSs. They tended to respond to the information if they felt they could. For example, they often slowed or changed lanes in response to a message indicating an upcoming incident, or diverted if they had knowledge of alternative routes.
- While awareness of the Internet site was high, both the Internet and the kiosks had only a minimal impact on pretrip plarming. This was due in part to the fact that both are targeted media, available only to particular groups of people. The **137** travelers surveyed did not include many from these groups.
- Further research should be conducted when the ATIS components are fully operational.

3.5.5.2 APTS Components

For the purposes of assessing the perceptions of the traveling public, the following APTS components were considered:

- ATIS itinerary planning.
- Smartcard fare collection.
- In-vehicle announcements (not operational).
- Passenger information devices (PIDs) (not operational).

The utility of the APTS components, and their influence on the public transit system, were evaluated during the Olympic Games through user feedback derived from interviews of the general traveling public. Surveys relating to these components were conducted at bus and rail stations and venue areas. The components assessed and the information requested were:

- **ATIS itinerary planning:** The extent to which travelers **were** aware of itinerary planning systems, extent to which such systems were understood by travelers, and traveler behavior responses arising from itinerary planning systems.
- **Smartcard fare collection:** The extent to which travelers utilized smartcards for fare payment, and the perceived usefulness of smartcards versus regular fare payment methods.
- **In-vehicle announcements:** The extent to which travelers were aware of information provided within vehicles, and the extent to which announcements were understood by travelers.
- **Passenger information devices (PIDs):** The extent to which travelers were aware of traveler information devices, the extent to which information was understood, and the behavior responses arising from information relayed on the devices.

It is important to note that only two of the listed APTS components, ATIS itinerary planning, and smartcard fare collection, were operational during the Olympic Games. However, **surveys** were completed for all four APTS components to provide information about similar existing systems. For example, questions for in-vehicle announcements related to MARTA Bus operators announcing stops over their radio systems and to the lighted station signs on MARTA Rail cars. These questions contributed to an understanding of the public perception of these systems, even though the systems were less sophisticated than the other APTS components.

The findings are based on 206 surveys. Again, with the population of the metropolitan area being over 3 million, the findings are indicative only and must be interpreted with caution. Also, as noted earlier, full implementation of some APTS components was not completed in time for the Olympic Games. For those components that were operational, little on-line testing and troubleshooting could be accomplished before the games. A more comprehensive program of assessment should be considered when the APTS components are fully operational.

A total of 206 surveys (separate from the 137 ATIS surveys discussed earlier) were completed during the Olympic Games. Nearly two-thirds of the respondents were not residents of Atlanta. Most of the surveys were conducted at venues within the Olympic Ring, although some were from the Stone Mountain area, which was an out-of-town venue. Table 3-20 shows the stated mode choices:

TABLE 3-20. Respondents' Modal Choice

Modal Choice	Olympic Ring Venues (Excludes Stone Mountain)	All Venues
OSTS Bus	17.5%	17.0%
MARTA Bus	6.2%	5.8%
MARTA Rail	33.5%	31.6%
MARTA Rail & Bus (OSTS or MARTA)	32.5%	32.0%
Car	8.2%	11.7%
Walk	0.0%	0.0%
Other	2.1%	1.9%

Source: BA&H Traveler Surveys

Within the Olympic Ring venues, nearly 90 percent of respondents used some form of transit to access the venues. Even for all venues, including Stone Mountain, the proportion was more than 85 percent. For Olympic Ring venues, 8 percent of respondents used car, and this proportion rose to nearly 12 percent when Stone Mountain venues were included.

Responses to questions on ATIS itinerary planning are presented in Table 3-21.

TABLE 3-21. ATIS Itinerary Planning

Question Asked	Response: Yes	Response: No
Did you use the itinerary planning services from the MARTA Customer Service line?	**10.7%**	**89.3%**
Did the itinerary planning service provide another route of travel other than originally planned?	**58.8%**	**41.2%**
Usefulness of itinerary planning	3.12	

Source: BA&H Traveler Surveys
Note: Usefulness was rated on a scale of 1 to 5, with 1 being not useful at all and 5 being very useful.

While only 11 percent of respondents used the MARTA customer service line for some form of itinerary planning, nearly 60 percent of those who did changed their travel pattern as a result. The usefulness rating of 3.12 indicates a "middle of the road" response. Additionally, approximately 6.8 percent of respondents commented that they had accessed the Internet to obtain itinerary planning information.

Responses to questions on smartcard fare collection are presented in Table 3-22. It should be noted that with a high proportion of non-Atlanta residents in the sample, and with the location of surveys being near the games venues, this analysis is unlikely to be typical for the entire Atlanta region. It is more indicative of the preferred fare payment method for spectators at the games.

At 1.9 percent of respondents, the smartcard was the least used form of transit fare payment. Since spectators holding tickets for the Olympic Games events were entitled to free use of MARTA Bus and Rail and the OSTS shuttle buses, it is not surprising that nearly 80 percent of respondents used their venue tickets to "pay" for transit use.

TABLE 3-22. Smartcard Fare Collection

QUESTIONS ASKED	RESPONSES (in descending order)					
Method of Fare Payment	Venue Event Ticket	Did Not Use Transit	Token	Cash	MARTA Pass	Visa Smartcard
	78.2%	11.7%	3.9%	*2.4%*	*1.9%*	1.9%
Ease of obtaining smartcard	Easy		Somewhat Easy		Not Easy	
	66.7%		*33.3%*		*0.0%*	
Reason for smartcard purchase	Convenience		Security		Provided by Agency	
	100%		0.0%		0.0%	
Any problems encountered while using Visa smartcard for transit fare payment?	Yes			No		
	0.0%			100.0%		
Have you used your Visa smartcard for any services other than transit?	Yes			No		
	75.0%			25.0%		
What services did you use the Visa smartcard for?	Retail		Restaurant		Automobile Fuel	
	20.0%		60.0%		20.0%	
Visa **smartcard usefulness** score	*4.22*					

Source: BA&H Traveler Surveys.
Note: Usefulness was rated on a scale of 1 to 5, with 1 being not useful at a// and 5 being very useful.

Of those who purchased a smartcard, three-quarters used it for nontransit purposes, mainly in restaurants and shops, and at gasoline pumps. During the interviews, many respondents who did not purchase a smartcard indicated that they already possessed a Visa credit card, which was accepted in the same places as the smartcard. Based on observations during the survey, it appeared that a majority of respondents who purchased smartcards did not realize they could be used for accessing transit services. The overall convenience of smartcards was high, and its usefulness was well rated.

Responses to questions on in-vehicle announcements are presented in Table 3-23. As stated earlier, the in-vehicle announcements component of APTS was not operational, and the responses reflect this. The various announcement types were:

- MARTA rail car station announcements.
- MARTA rail car visual display of station names.
- MARTA bus operators bus stop announcements.

Such announcements are mandated under the Americans with Disability Act (ADA).

TABLE 3-23. In-Vehicle Announcements

Questions Asked		Response			
If you rode MARTA bus or rail today, did you hear or see any of the in-vehicle stop announcements?		Did Not Notice	Yes on MARTA Bus	Yes on MARTA Rail	
		84.3%	6.0%	9.7%	
Did you understand the stop announcements as you were enroute to your destination?	Yes on MARTA Bus	No on MARTA Bus	Yes on MARTA Rail	No on MARTA Rail	
	87.5%	12.5%	38.5%	61.5%	
Did the announcements assist you with identifying your stop?	Yes on MARTA Bus	No on MARTA Bus	Yes on MARTA Rail	**No on** MARTA Rail	
	75.0%	25.0%	30.8%	69.2%	
Usefulness of in-vehicle announcements		3.09			

Source: BA&H Traveler Surveys
Note: Usefullness was rated on a scale of 1 to 5 , with 1 being not usefull at all and 5 being very useful.

Nearly 85 percent of respondents did not notice any in-vehicle announcements, on either MARTA Rail or Bus services. Of those who did, the majority were on MARTA Rail. Of those who did notice in-vehicle announcements, those commenting on MARTA Bus **services said the announcements** were more understandable and more useful. Overall, in-vehicle announcements were rated average for usefulness.

Passenger information devices (PIDs) were not operational during the games, although the nine PIDs in rail stations occasionally provided static schedule information about connecting bus services. The six bus stop PIDs only displayed a "Welcome to MARTA" message. Only 10.9 percent of respondents noticed the PIDs.

In summary, the findings of this component of the Event Study were:

- Full implementation of all APTS components was not completed in time for the Olympic Games. For those components that were operational, little on-line testing and **troubleshooting** was accomplished before the games. Consideration should be given to a more comprehensive program of assessment when the APTS components are fully operational.
- Because of the relatively small sample sizes, the findings presented are indicative only and must be interpreted with caution.
- For venues within the Olympic Ring, nearly 90 percent of respondents used some form of transit to access the venues.
- While only 11 percent of respondents used the MARTA customer service line for itinerary plannin g, nearly 60 percent of those who did changed their travel pattern as a result.

- At 1.9 percent of respondents, the smartcard was the least-used form of all fare payment methods available. Nearly 80 percent of respondents used their venue tickets to "pay" for transit.
- Nearly 85 percent of respondents did not notice any in-vehicle announcements, on either MARTA Rail or Bus services. Of those who did, the majority were on MARTA Rail services.

3.5.5.3 Kiosks

The Georgia Institute of Technology performed a survey of kiosk users between July 26 and August 5, 1996. Eighty-five surveys were completed at 10 kiosk locations. The responses included the information shown in Table 3-24.

TABLE 3-24. Kiosk Information Accessed

Information Accessed	Percent Accessing the Information	Percent Indicating Information is "Most Valuable" (Unweighted)
Atlanta Metropolitan Area Traffic Conditions	36	22
Olympic Games	50	18
Weather Conditions	51	13
MARTA itinerary Planning	17	9
MARTA Transit Schedules	29	8
Travel and Tourism	47	7
Hartsfield Airport Airline Schedules	13	7
Atlanta Metropolitan Area Route Planning	30	3
ARC Ride Sharing/Carpooling	3	1
Amtrak Schedules	3	0
CCT Schedules	3	0
Greyhound Schedules	3	0

Source: Atlanta Kiosk FOT Field Evaluation, Georgia Tech. Research Institute (GTRI)

It is interesting to note that the MARTA itinerary planning system was not available on the kiosks, although many respondents stated that they accessed it. It is possible that they construed "schedule information" for itinerary planning data. The most frequently accessed information was weather conditions, Olympic Games, travel and tourism, and metropolitan area traffic conditions.

3.5.6 Agencies' Media Plans, and Transportation System Performance as Reported in the Media

The ITI groupings covered in this study were:

- Freeway Management.
- Incident Management.
- Transit Management.
- Regional Multimodal Traveler Information.
- Traffic Signal Control.
- Electronic Fare Payment.

The non-ITI groupings covered were:

- Olympic and Paralympic Games Transportation Operations.
- Travel Demand Management.
- Other Infrastructure.

The local Atlanta newspapers, together with the New York Times and The Washington Post, were the principal sources of media comments for our assessment. These newspapers were reviewed daily during the Olympic and Paralyrnpic Games, for articles, reader comments and letters, and editorials regarding transportation. Other media sources included *The London Daily Telegraph* the *Hagerstown MD Journal, The* St. *Joseph MO Herald-Pavilion*, and CNN television news. These media sources were not scanned daily, but friends and relatives of members of the project team sent clippings from these papers that referenced transportation.

The media served to provide public information on three main areas:

- Advance information regarding travel during the Olympic and Paralympic Games.
- Reports on the operation of the OTS during the games.
- Editorial comments regarding transportation during the games.

Before the games, ACOG, ARC, GDOT, MARTA, FHWA, and FTA combined their efforts to create pregames press releases coordinated by the Commute Connection Network (CCN). The first of the combined press releases was issued on January 16, 1996. The main purpose of this press release was to highlight the need for employers, particularly downtown employers, to assist their employees with commute alternatives. Also, two full-page advertisements were taken out by the coalition. The advertisements focused on the potential for heavy traffic congestion and the need to find alternative means of travel. Alternatives emphasized were: taking vacation, shifting work hours, telecommuting, and creating Carpools and Vanpools. The AJC reported this information on January 17, 1996.

The AJC served as one of the most important sources of public information regarding Olympic and Paralympic Games travel. A guide to travel during the Olympic Games, entitled "Surviving Olympic Traffic," was published on June 28, 1996. It was also available as a stand-alone piece free to the public at libraries, public buildings, MARTA stations, and other locations, throughout the Olympic Games period (until the supply was exhausted). The guide was the product of information provided by ACOG, ARC, GDOT, and MARTA. The core message was that most of the downtown would be closed to traffic and on-street parking, and that extensive delays could be expected throughout the region. The guide suggested that travelers be prepared for "2-hour delays for routine travel," and "Using MARTA trains and buses will be a must." This message was also broadcast on the radio and television news reports in the weeks leading up to the games. The entire region was prepared for gridlock and responded accordingly, as noted in Section 2.5.2, which discussed the Travel Demand Management program.

Additionally, MARTA prepared and distributed pregames media kits, including information about the expected crowding on the MARTA rail system, the potential for MARTA rail parking lots to be full, and overall information on getting around during the Olympic Games. MARTA staff were interviewed by the national and international press throughout June and July before the games began. Each day during the Olympic Games, MARTA provided press releases indicating the previous day's estimated ridership and the projected ridership for the following day. These were provided to the Associated Press, the Cable News Network, and local media.

In the pregames media kits, the phone numbers of MARTA's three press contacts were provided. Calls were answered on a first-come, first-served basis. If requested, individual interviews were provided. MARTA staff were also daily guests on a local radio talk show during the Olympics. This provided an opportunity to respond directly to public concerns and provide additional information. MARTA coordinated with ACOG when providing comments to the media. This was very important since most of the public and the press did not understand that bus operations were divided between MARTA and ACOG, with MARTA operating the spectator fleet and ACOG operating the Olympic Family fleet.

GDOT distributed two games-related press releases before the Olympic Games. One described the features of the ATMS, the other introduced the GDOT HERO program. The GDOT staff were also actively involved in responding to press inquiries during the Olympic Games. Typically, calls were taken by three key contacts. Most of the information requested concerned access to venues and the status of traffic volumes and congestion on the area freeways.

The USDOT Information Resource Center (IRC) prepared daily press releases describing the previous day's transportation-related news. The press releases covered OSTS, MARTA Bus, MARTA Rail, surface street, and freeway operations.

Each day, the AJC printed inforrnation about venue access, MARTA procedures and etiquette, ACOG Park & Ride operational changes, and street closures for road races. This was the most central location for Olympic Games travel information. Travelers responded favorably to the information provided in the newspaper (see Section 3.5.5).

The overall impression presented by the media reports on the performance of the transportation facilities during the Olympic Games was generally negative. Reporting became somewhat more neutral near the middle of the games, after many transportation problems had been solved.

A review of the press releases and media reports provided some insights into this negativity. First, even though the public and press had been informed that crowds would be quite heavy on MARTA Rail, the press reports of crowded conditions had a negative cast. This pointed out that, even if information was provided on an unsatisfactory condition, the fact that it was unsatisfactory was inevitably reported as negative, particularly since normal conditions were better. Second, it would have been helpful to MARTA if the Olympic Family buses under ACOG control and the OSTS buses operated by MARTA had been readily distinguishable. Many of the transit issues that were most apparent to the press concerned the ACOG fleet. Since both fleets were painted in Olympic blue and since MARTA was the local agency responsible for bus operations, any references to bus problems were attributed to MARTA. MARTA's image suffered even if the operations were ACOG's responsibility. Last, MARTA felt they could have provided more information about how to ride crowded trains before the games, in the hope that it would have helped alleviate some rider confusion.

In summary, the findings of this component of the Event Study were:

- The press disseminated important travel information both before and during the games.
- The roles and responsibilities of transportation operations agencies should be clear to the press and public. This will avoid confusion and possible negative attitudes toward transportation agencies that might linger after the games. For example, the organizational differences between OSTS and MARTA were not clear to the Atlanta press. Bus problems were attributed by the media to MARTA during the first week of the games, in part because the press could not differentiate between OSTS bus breakdowns (which accounted for most of the incidents) and MARTA Buses (which were rarely used on the freeways).
- The press is generally inclined to report on negative situations and ignore the positive ones. Warning the press in advance could reduce such negative reports.

3.6 TRANSFERABILITY

3.6.1 Unplanned Modifications to Transportation Management Plans During the Olympic Games and for the Paralympic Games

This objective was to document unplanned modifications to the transportation management plans during the Olympic Games, in the following areas:

- Modifications to interagency arrangements.
- Modifications by individual agencies to intraagency arrangements.
- Modifications within agencies at a working level.

The implementation of such modifications may have been indicative of lessons learned, each with a potential transferability value.

No specific observations were made of any such modifications, although data were presented elsewhere about day-to-day operations, e.g., modifications to methods of crowd control by MARTA, necessitated by higher than expected rail ridership levels, Possible reasons for the apparently small number of modifications include:

- Agencies were satisfied that their respective transportation management plans were working well.
- Agencies had insufficient evidence to justify modifying their respective transportation management plans.
- Agencies considered that modifying their respective transportation management plans could lead to confusion among the staff.
- Modifications occurred but were not documented by the agencies, and hence no information was available.

3.6.2 Transferability of Key Lessons Learned to Other Locations/Major Events

In this part of the Event Study, the ITI groupings covered were:

- Freeway Management.
- Incident Management.
- Transit Management.
- Regional Multimodal Traveler Information.
- Traffic Signal Control.
- Electronic Fare Payment.

The non-TTI groupings covered were:

- Olympic and Paralympic Games Transportation Operations.
- Travel Demand Management.
- Other Infrastructure.

Many observations were made at the post-games workshop held on September 6, 1996. The 13 agencies listed in Section 3.5.4 were represented. In addition, the following agencies from outside the State of Georgia, with a specific interest in learning lessons from Atlanta for upcoming events and ITS deployments, were represented at the workshop:

- FHWA HQ, Washington, D.C.
- FHWA Region 8.
- FHWA Utah Division.
- PTA HQ, Washington, D.C.
- PTA Region 8.
- New South Wales Roads and Traffic Authority, Sydney, Australia.

The **following** discussion relates workshop participants' views on the transferability of the lessons learned and recommendations to other locations and events (notable events being the Sydney Olympic Games in the year 2000 and the Salt Lake City Winter Olympic Games in the year 2002). Section 4.0 presents a more comprehensive set of lessons learned and recommendations from the proceedings of this workshop and all other data collected for the Event Study.

3.6.3 Transferability Matrix

The workshop participants completed a transferability worksheet, which is summarized in Tables 3-25, IT1 Components, and 3-26, Organizational Components, and Plans and Programs. This table indicates the number of participants responding to each item's performance.

TABLE 3-25. Transferability Matrix: ITI Components

Element	Function/ Purpose	Ease of Implementation			Performance			Usefulness for Event Management		
Intelligent Transportation Infrastructure		Very Easy	Somewhat Easy	Rather Difficult	Good	Fair, Could Improve	Poor, Must Improve	Very Useful	Somewhat Useful	Marginally Useful
Freeway Management										
CCTV cameras	Monitor traffic operations/flow	11	5	2	15	4	0	16	2	1
Communications trunk	Communications with field devices	1	5	2	4	4	1	6	5	0
Variable message signs	Driver information re: congestion	2	11	1	6	7	1	9	6	1
Highway advisory radio	Driver information re: congestion	0	4	5	0	3	6	4	6	1
Incident Management										
Communications trunk	Efficient inter agency communication	0	8	3	5	6	0	8	4	0
HEROs	Incident detection, prompt clearance	8	5	2	14	2	0	13	1	1
Service/tow trucks	Prompt clearance	5	5	1	8	4	0	11	1	0
Variable message signs	Driver information to reduce congestion	1	6	1	4	8	0	8	4	0
Highway advisory radio and signs	Driver information to reduce congestion	2	3	3	2	3	4	4	4	1
Transit Management										
Automatic vehicle location system	Enhance bus fleet management and maintenance	1	2	2	3	1	0	3	1	0
Automatic passenger counting system	Enhance and improve service level management	1	0	2	1	0	1	2	0	1
Train control system	Increase efficiency of operation and maintain safety	3	1	0	4	2	0	6	0	0
Smartcard fare system	Improve fare collection management and information	1	3	0	3	1	0	5	2	2
In-vehicle stop announcements	Increase accessibility of passenger information	1	2	2	3	2	1	6	0	0
Passenger information devices	Provide real time bus route information	0	2	2	1	2	1	2	2	0
Traffic Signal Control										
CCTV cameras	Monitor traffic operations/flow	7	6	1	13	2	0	11	14	2
Traffic signal control system	Maximize Network Capacity	0	5	5	0	7	2	7	3	1
Regional Multimodal Traveler Information										
Internet site	Traveler information, reduce congestion	5	2	1	6	4	0	4	4	2
Kiosks	Traveler information, reduce congestion	0	1	3	4	1	0	2	4	0
MARTA customer assistance line	Itinerary Planning	4	3	0	4	4	0	7	2	2
Cable TV "traffic" station	Traveler information, reduce congestion	4	3	3	9	3	1	9	2	2
Electronic Fare Payment										
Smartcard fare system	Expand capabilities of fare collection system	1	3	0	3	1	0	2	2	0

Source: Post-games workshop organized by BA&H on September 6, 1996

The "Ease of Implementation" question in Table 3-26 referred only to using the component during the Olympic Games, not to the process of implementing the system. The components considered the easiest to implement were CCTV (freeway and surface street) and GDOT HEROs. Traffic signal control systems and HAR were considered rather difficult to implement. It was noted earlier in this study that HAR was not operational during the games.

Table 3-25 also shows that participants selected CCTV cameras (freeway), GDOT HEROs, the ACOG/MARTA service/tow trucks, CMS (freeway), and the cable TV traffic information channel as the most useful components for event management, with good overall performance. Participants also considered that CCTV cameras on surface streets performed well, but were less convinced of their overall usefulness for event management. Most other components scored reasonably well for usefulness and performance, except HAR, which was rated as generally poor for performance.

Votes for the transit management and electronic fare payment components were generally lower than the other ITI components. This may have been because fewer transit representatives participated in the workshop, and participants only voted for those areas in which they had specific knowledge. The train control system scored well for ease of implementation, performance, and usefulness. The MARTA customer assistance line and in-vehicle stop announcements were rated highly for usefulness, but less so for ease of implementation and performance.

TABLE 3-26. Transferability Matrix: Organizational Components, and Plans and Programs

Element	Function/Purpose	Ease of Implementation			Performance			Usefulness for Event Management		
Organizational Components		Very Easy	Somewhat Easy	Rather Difficult	Good	Fair, Could Improve	Poor, Must Improve	Very Useful	Somewhat Useful	Marginally Useful
GDOT TMC	Central communications hub, freeway management	7	4	2	12	3	0	13	2	0
Atlanta TCC	Surface street traffic management	5	1	3	6	4	0	9	1	0
MARTA TIC	Bus fleet and operator management	4	3	2	5	4	0	10	0	0
Clayton County TCC	Surface street traffic management	1	3	2	5	2	0	5	0	2
Fulton County TCC	Surface street traffic management	1	0	4	1	2	3	4	1	1
Gwinnett County TCC	Surface street traffic management	2	2	2	5	2	0	7	0	0
Cobb County TCC	Surface street traffic management	1	2	3	3	1	3	5	1	1
De Kalb County TCC	Surface street traffic management	1	1	4	5	3	0	8	0	0
ATOC	Maintenance of order and safety	3	3	2	5	5	0	10	0	0
Spectator System Command and Control Center	Coordinate MARTA terminal, MARTA rail, MARTA bus, TMC and venue operations	2	5	0	7	2	0	6	2	0
TRANS OPS 1/ TRANS OPS 2	ACOG coordination with TMC/ATOC	2	7	0	7	4	0	9	2	0
Resource Table	Management of human and physical resources during major incidents	5	4	0	8	5	0	10	3	0
Command Table	Management decisions on major transportation issues	5	3	0	7	4	0	10	1	0
Plans and Programs										
Freight Management Plan	Ensure goods movement	1	4	0	5	2	0	6	1	0
Transportation Demand Management	Ensure traveler movement	3	5	0	8	2	0	8	2	0

Source: Post-games workshop organized by BA&H on September 6, 1996

Table 3-26 indicates that participants considered the GDOT TMC, MARTA TIC, Atlanta TCC, the TCCs at De Kalb and Gwinnett Counties, and ATOC to be particularly important and useful for event management. Each of these centers was rated fair for performance, and, to a lesser extent, usefulness. With the exception of GDOT TMC, no center was particularly well rated for ease of implementation. The Resource and Command Tables, SSCCC, and ACOG's TransOps 1 and 2 followed a similar pattern, i.e., highly rated for usefulness, slightly less so for performance, and lesser for ease of implementation.

Under the Plans and Programs heading, freight and travel demand management were well rated for performance and usefulness, but to a lesser extent for ease of implementation.

In summary, the findings of the transferability component of the Event Study were as follows:

- The components considered the easiest to implement were CCTV (freeways and surface streets) and GDOT HEROs. Traffic signal control systems and HAR were considered difficult to implement.
- Participants selected CCTV cameras (freeways), GDOT HEROs, the ACOG/MARTA service/tow trucks, CMS (freeways), and the Cable TV traffic information channel as the most useful components for event management, with good overall performance.
- The train control system scored well for ease of implementation, performance, and usefulness.
- The MARTA customer assistance line and in-vehicle stop announcements were rated highly for usefulness, but less so for ease of implementation and performance.
- Participants considered the GDOT TMC, MARTA TIC, Atlanta TCC, the TCCs at De Kalb and Gwinnett Counties, and ATOC to be particularly useful for event management. Each of these centers was rated fair for performance and, to a lesser extent, for usefulness.
- The Resource and Command Tables, SSCCC, and ACOG's TransOps 1 and 2 followed a similar pattern: highly rated for usefulness, slightly less so for performance, and less so again for ease of implementation.
- Freight and travel demand management were well rated for performance and usefulness, but to a lesser extent for ease of implementation.

4.0 CONCLUSIONS

This section builds on the findings described in Section 3.0 for each objective, and develops a series of lessons learned and recommendations. This is followed by a discussion of the next steps for outreach, and for distribution of this Final Report.

4.1 INTRODUCTION

4.1.1 Structure

As stated in Section 3.2, the lessons learned and recommendations have been structured according to six of the nine IT1 groupings:

- Freeway Management.
- Incident Management.
- Transit Management.
- Regional Multimodal Traveler Information.
- Traffic Signal Control.
- Electronic Fare Payment.

The remaining three IT1 groupings (Electronic Toll Payment, Railroad Grade Crossings, and Emergency Management Services) were not addressed by any of the Atlanta ITS deployments.

Three supplementary groupings have been added, to reflect the non-IT1 components within the scope of the Event Study:

- Olympic and Paralympic Games Transportation Operations.
- Travel Demand Management.
- Other Infrastructure.

Lessons learned and recommendations are presented incrementally as follows:

- Local Atlanta perspective (IT1 and non-IT1 groupings).
- Summarized local Atlanta perspective (functional groupings).
  - Operational.
  - Technical.
  - Institutional.

- National perspective (IT1 and non-IT1 groupings).
- Summarized national perspective (functional groupings-event management).
  - Operational.
  - Technical.
  - Institutional.
- Summarized national perspective (functional groupings-routine transportation operations).
  - Operational.
  - Technical.
  - Institutional.

4.1.2 General Comments

The study's conclusions, presented in the form of lessons learned and recommendations, relate to the data collected during the games, which in turn were governed by the assessment areas established at the commencement of the Event Study. The conclusions represent an assessment of specific aspects of transportation operations during the games. The Event Study was not intended to judge overall transportation performance.

Inevitably, the reporting of lessons learned and recommendations tends to highlight issues that could have been handled differently. From the outset, the Event Study approach has been to be objective, independent, and constructive. The overall impression during the Olympic and Paralympic Games was that all personnel contacted approached the challenges facing them with commitment and diligence, and their efforts are recognized. No criticism of any individual or organization is intended by this report, nor should any be inferred. Although not a specific finding of the Event Study, it is clear that GDOT played the pivotal role in incident management during the Olympic and Paralympic Games. By a similar token, MARTA played the pivotal role in meeting games-related and commuter travel demand.

From a local Atlanta perspective, there are 18 recommendations, most of which are under IT1 groupings. Ten of the recommendations are related to incident management alone, which indicates that this was one of the most frequently applied ITS components during the games. To a certain extent, this result is also a consequence of the way in which the IT1 groupings have been applied in this report. In effect, incident management is a subset of both freeway management and transit management. Each of these groupings has only one recommendation.

Each recommendation identifies the agencies affected. As the lead agency for the Atlanta ITS deployments, GDOT is the target for many of the recommendations. No recommendations are made in this section under the Olympic and Paralympic Games Transportation Operations grouping. These are considered to have no applicability from an Atlanta perspective, since the games will most likely be held elsewhere in the future. Therefore, recommendations under this grouping are made from a national perspective later in this report.

4.2 LESSONS LEARNED AND RECOMMENDATIONS-LOCAL ATLANTA PERSPECTIVE

Each lesson learned with a local Atlanta perspective is followed by a series of supporting findings, which are cross-referenced in Section 3.0. These supporting findings are then followed by the corresponding recommendation.

4.2.1 Freeway Management

Proactive management of freeways is made possible by real-time knowledge of traffic and roadway conditions. This information is an important input for incident management and traveler information systems.

In Atlanta, the primary traffic surveillance technologies operational during the games were CCTV cameras and radar speed detectors. Patrols by GDOT HEROs, Metro Network spotters, and other agency personnel were an additional source of traffic information. Cellular phone calls to GDOT, using the *DOT network, also provided traffic information from the motorists.

In addition to the interface with incident management and regional traveler information, GDOT's TMC routinely monitors traffic flow and posts messages via CMSs to advise motorists of freeway conditions.

4.2.1.1 <u>Field Devices and Patrol Resources Deployment</u>

Lesson Learned

- Traffic surveillance devices and field patrols were intentionally concentrated on freeways inside the I-285 perimeter during the games, but this may not be the most optimal deployment plan for post-games operations.

Supporting Findings

- The deployment of GDOT HEROs was focused to meet GDOT's strategy to maximize coverage along the freeways that were most critical to operations during the Olympic Games (Ref.: Section 3.3.1.4).

- In keeping with experiences elsewhere around the nation, aerial surveillance can be very effective, but clear criteria for its use need to be established (Ref.: Section 3.3.3.1).
- Two-thirds of the incidents within the perimeter were detected by CCTV, GDOT HEROs, and *DOT callers (Ref.: Section 3.3.3.2).
- More than half of the incidents located on or outside the perimeter were detected by Metro Network spotters, Atlanta TIS, and the TCCs (Ref.: Section 3.3.3.2).
- Any reduction in the coverage of the Metro Network spotters and Atlanta TIS in the post-games period may potentially impact GDOT's future ability to detect incidents on and outside the perimeter (Ref.: Section 3.3.3.2).
- Ninety percent of incidents located within the perimeter were verified by CCTV, GDOT HEROs, and GDOT personnel at the incident scene (Ref.: Section 3.3.3.2).
- Eighty-one percent of incidents located on and outside the perimeter were verified by county/city PDs, Metro Network spotters, CCTV, GDOT HEROs, and the TCCs (Ref.: Section 3.3.3.2).
- The extensive deployment of video imaging cameras on freeways inside the perimeter provides additional flexibility to TMC operators (Ref.: Section **3.3.3.2).**
- There is a noticeable difference between the confidence with which TMC operators could verify and manage incidents where CCTV coverage was available (predominantly I-75 and I-85 inside the perimeter) versus where it was not available (I-20, I-285 perimeter, and US-78) (Ref.: Section 3.3.3.2).

Recommendation

- GDOT should review its GDOT I-IERO deployment plans and assess the need for and location of additional field devices, such as CCTV cameras and CMS, as part of a post-Olympics operations plan.

Significant parts of the ATMS became operational just prior to or soon after the Olympic Games commenced. HERO operations were operational as of January 1996. Much of the operations plans developed and implemented during the observation period were tailored to meet Olympic Games operations. This includes details such as HERO routes, CCTV, other traffic surveillance deployment and usage, and CMS operations video imaging cameras. In the post-games period, traffic conditions have returned to pre-Olympics patterns, and a new set of criteria are recommended for addressing additional needs, especially those of the I-285 perimeter, which carries a significant number of motorists. The GDOT HERO operations plan will also benefit from further integration with the electronic monitoring system, a computerized database of dispatch and response data which will allow the monitoring of HERO operations.

4.2.2 Incident Management

Rapid and effective incident response can reduce travel delay and even save lives. Real-time input from freeway and arterial surveillance systems is essential for incident detection and verification. Interagency cooperation is important for incident response, incident clearance, on-scene management, traffic control, and traveler information dissemination. In Atlanta, GDOT's TMC **is** the focal point of freeway incident management. An important feature of the TMC is a digital regional map that allows operators to display incident locations and assists in incident management.

4.2.2.1 Future Monitoring: of Incident Clearance

Lesson Learned

- While there were indications of improving trends **in incident** clearance times during the games period, the data collection duration was insufficient to assess fully the impact of incident management operations.

Supporting Findings

- **An apparent improvement** in mean time to clear incidents after incident verification, from 40.5 min to 24.9 min was observed, despite reductions in the **operating** hours of GDOT HEROs and reduced staffing levels of TMC operators (Ref.: Section 3.3.1.3).
- At locations on and outside the perimeter, incidents took longer to clear than those inside the perimeter. On average, this difference was 20 min during the games (Ref.: Section 3.3.1.3).
- No overall conclusions on incident clearance performance can be made at this time. A much longer period of data collection is required before any firm conclusions can be drawn (Ref.: Section 3.3.1.3).

Recommendation

- GDOT should commence an ongoing analysis of incident clearance times.

Incident clearance times are subject to a number of factors, as discussed in Section 3.0. Unlike incident verification, declaration, and icon placement, incident clearance times largely depend on factors beyond the control of the GDOT TMC. Evidence of the extent to which GDOT TMC has influenced improvements in incident clearance times requires comparisons between incidents with similar characteristics over a period of time.

4.2.2.2 Future Monitoring of Operator Performance

Lesson Learned

- The ATMS does not currently possess the ability to monitor operator performance. Therefore, their impact on incident management, the impact of the system, and improvements gained from future enhancements of the system cannot presently be measured.

Supporting Findings

- The video imaging camera-based incident detection algorithm was not operational during the games. It is reasonable to assume that incident detection and verification performance will improve when the video imaging system is fully operational (Ref.: Section 3.3.1.1).
- The TMC is able to search the IMS database for incident trends, such as numbers, locations, types, and levels of incidents, but, it is unable to perform analysis trends of incident management (Ref.: Section 3.3.1.3).

Recommendation

- GDOT should enhance the ATMS software to allow the tracking of operator performance.

While analyses of incident numbers, types, locations, etc., can be performed with the present configuration, an analysis of verification times, declaration times, icon placing times, and incident clearance times is not possible. This situation prevents GDOT from fully understanding the impact of the TMC on incident management, and it denies opportunities to identify where further improvements may be possible or required.

In the short term, operators could enter text fields into the IMS database after incidents are verified, icon placement is completed, and traffic lanes are cleared. The system will automatically time-stamp these, facilitating a manual analysis. In the longer term, system software could be modified to create specific data fields for the items listed here. This will enable an easy, automatic analysis of performance.

4.2.2.3 Future System Enhancement

Lesson Learned

- In general, the ATMS was well received in terms of its capabilities and user friendliness. One area identified as needing enhancement was icon placing, which is time-consuming even for a skilled operator.

Supporting Findings

- The TMC staff was generally enthusiastic about the new capabilities provided by the ATMS (Ref.: Section 3.5.1.1).
- The TMC staff was most pleased with the capabilities provided by the CCTV cameras. They perceived that the CCTVs had drastically improved the time to verify incidents. They were also very pleased with the IMS software, but suggested several improvements (Ref.: Section 3.5.1.1).
- The system did not present any ease-of-use problems, except for icon placement during the first week of the Olympic Games (Ref.: Section 3.3.2.5).
- The week-by-week improvement in the time needed for icon placement appears to be slowing, perhaps suggesting that the process is approaching the minimum feasible time within the limits of the existing hardware/software **configurations.** A review of possible performance enhancements by GDOT may **be justified, if** further reductions in the icon placement time are to be **achieved (Ref.: Section 3.3.1.2).**

Recommendation

- GDOT **should review the** icon placement process of the IMS to determine if hardware or software changes can further improve speed.

Every second saved in placing an icon represents the faster generation of response plans. This in turn mitigates the impact of an incident on motorists. Hardware enhancements may be able to improve system speed. Software enhancements, such as the use of an index of street names or interchange numbers, may also facilitate operators' use of the system.

4.2.2.4 Operations of the GDOT HERO Svstem

Lesson Learned

- Overall, the performance of the GDOT HEROs was impressive. However, working on freeways next to traffic lanes is an unforgiving environment for those who do not remain alert, even for well-trained HERO crews.

Supporting Findings

- GDOT HEROs provide an extremely flexible service for motorists, including accident scene assistance (Ref.: Section 3.3.1.4).
- GDOT HEROs have achieved acceptance from the motoring public and other participating agencies involved in incident management (Ref.: Section 3.3.1.4).
- GDOT HEROs were especially important during the Olympic Games, assisting with numerous bus breakdowns and helping out during bomb scares in downtown Atlanta (Ref.: Section 3.3.1.4).
- GDOT HEROs **may occasionally find** themselves in situations where they overlook safety risks (Ref.: Section **3.3.1.4).**

Recommendation

- Because of the risks inherent in incident management activities, GDOT HERO **operations should incorporate additional training emphasizing** ongoing sensitivity to risk **factors.**

As ambassadors for GDOT, the HEROs have earned widespread acceptance from the motoring public and other incident management agencies. The safety aspects of **HERO** operations are crucial to their **continued** success and should be continuously monitored as part of ongoing training and safety reviews. This activity could be supported using the TMC's CCTV video-recording capability.

4.2.2.5 Effectiveness of GDOT HERO Operations

Lesson Learned

- At the present time, no quantitative means exist to determine the optimum deployment of GDOT HEROs.

Supporting Findings

- It is not possible to use existing TMC database systems to evaluate the performance of the GDOT HEROs, or measure their impact on specific incidents (Ref.: Section 3.3.1.4).

Recommendation

- GDOT should implement measures to monitor HERO performance.

While an expansion of the service should be considered, possibly including patrols on the I-285 perimeter and freeways beyond the perimeter, it is difficult to determine optimal deployment arrangements without performance assessments. An understanding of the time needed between a request for a HERO and the arrival of the HERO at the incident scene, and an assessment of clearance time-savings resulting from HERO actions, are important parameters needed to quantify HERO performance.

4.2.2.6 Effectiveness of Interagency Coordination for Major Incidents

Lesson Learned

- Examples of interagency coordination were observed during the games, but **without a new interagency approach to handling major** freeway incidents that involves office and field-based staff, the full benefit of the ATMS will not be achieved.

Supporting Findings

- The local PD was not fully familiar with the capabilities of the ATMS during the games period (Ref.: Section 3.3.1.5).
- Management of the I-85 mobile home/bulk cement tanker incident resulted in avoidable traffic delays, because of a breakdown in communication between the local PD and GDOT/ATOC (Ref.: Section 3.3.1.5).
- While the I-85 incident highlighted specific communications issues in the county concerned, it also demonstrated the lack of communication between the TMC and the local PD, and between the TMC and MARTA TIC (Ref.: Section 3.4.2.1).
- The staff at all centers considers that the training received to date is inadequate for their needs. Perhaps due to the focus on the games and the lack of full functionality in all centers, no formal training was given

regarding the different ways each center planned to use the system (Ref.: Section 3.4.2.2).

- Agreements are not yet developed regarding GDOT control of non-GDOT signals for incident management when TCCs are not staffed (Refs.: Sections 3.4.1.3 and 3.5.1.2).
- GDOT District 7 has developed a handbook of diversion plans, detailing diversion setups for blockages on any section of the Atlanta metropolitan freeway network. However, these diversion plans have not been approved by the other agencies affected (Ref.: Section 3.4.1.3)
- Relationships with other agencies were improved with the planning and implementation of the ATMS system, in particular with 911 operators, police agencies, and the city of Atlanta (Ref.: Section 3.5.1.1).
- The TCC staff was very pleased to be participating in a regional incident management program. They were very happy to have the new tools, such as CCTV, to assist them in daily traffic management (Ref.: Section 3.5.1.2).
- Since the introduction of the ATMS, coordination involving the city and the counties has been much more active. This activity has been in the form of meetings at ARC or technical meetings at GDOT. However, many have noted that their inputs to the selection of traffic signal control system components have not been fully considered by GDOT (Ref.: Section 3.5.1.2).
- During the beginning of the event period, transit operations staff members were entering incidents into the IMS. However, it is unclear whether these incidents were received by the TMC (Ref.: Section 3.5.1.3).
- Overall, staff within the MARTA TIC indicated that they were unclear on the lines of communication with the TMC regarding the use of the IMS. Staff indicated that CCTV cameras could be effective tools in resolving transit and roadway incidents, but more communication was necessary with the TMC and other TCCs to benefit fully from these systems (Ref.: Section 3.5.1.3).
- An ARC initiative is under way for devising a new interagency approach to freeway incident management. An incident management handbook is being prepared jointly by ARC and GDOT. It is understood this is currently pending a “launch” meeting. Implementation of such an approach, in conjunction with corresponding training, may greatly improve interagency coordination during major incidents (Ref.: Section 3.3.1.5).

Recommendation

- FHWA, FTA, GDOT, ARC, the city of Atlanta, MARTA, and other local agencies should pursue and implement an integrated, multiagency approach to incident management operations.

Much remains to be done, including the development of interagency agreements, and team-building among the agencies and individuals involved. At the present time, full functionality has not been reached. This presents an opportunity to capitalize on the successes of the games and achieve maximum efficiency when all system components are fully functional.

The initiative by ARC, with the participation from GDOT and other local agencies, towards a new interagency approach to freeway incident management is an appropriate basis on which to proceed. The approach adopted must involve operations staff from the TMC, MARTA TIC, TCCs, and those involved in on-scene management, such as GDOT HEROs, police officers from all enforcement agencies, and other emergency services staff. In due course, joint agency team-building and training workshops with operators from each agency involved are methods for achieving widespread buy-in.

4.2.2.7 Effectiveness of the IMS at the TMC

Lesson Learned

- The IMS was an effective tool at the locations where it was available during the games. It will be more a powerful tool when its coverage is complete.

Supporting Findings

- The majority of incidents occurred in locations where response plans could not be generated by the system. **Manual** response plans were prepared for 21 of these incidents (Ref.: Section 3.3.2.1).
- System-generated response plans were accepted without modification for only 19 out of 152 incidents (Ref.: Section 3.3.2.1).
- Incident response plans do not include HOV lane CMSs. These signs account for 17 of the 44 CMSs in the ATMS coverage area (Ref.: Section 3.3.2.1).
- GDOT District 7 has developed **a** handbook of diversion plans, with detailed diversion setups for blockages on any section of the Atlanta metropolitan freeway network. However, these diversion plans have not been approved by the agencies affected (Ref.: Section 3.4.1.3).
- During the Olympic Games, TMC operators needed assistance to learn more about the incident response library. After the games, the operators continued to learn the full range of options provided by the ATMS software (Ref.: Section 3.5.1.1).

Recommendation

- GDOT, in conjunction with other local agencies should complete the library of response plans and the associated operator training.

These plans should include consideration of the use of the HOV lane CMSs wherever possible. As more plans are added, operators will need training to familiarize themselves with the new plans.

Lesson Learned

- During some level II or higher incidents, TMC operators implemented response plans manually, even though the IMS could generate appropriate response plans automatically for such incidents.

Supporting Findings

- Once the vehicles are moved off the road to the shoulder, the TMC's standard operating incident management procedures direct operators to terminate the incident so the icon can be deleted. For incidents that create extensive traffic **backups,** deleting the icon may be premature if traffic congestion continues. This type of situation required the manual implementation of a response plan, since the incident was deleted and the IMS could not generate a response plan (Ref.: Section 3.3.2.1).

Recommendation

- **GDOT should review** procedures for terminating **level** II and higher incidents when they are moved to the shoulder.

The preferred solution is to avoid the manual generation of response plans for incidents in which the IMS has the ability to generate a response plan automatically.

4.2.2.8 Effectiveness of the IMS at MARTA TIC

Lesson Learned

- The loss of accessibility to the IMS can adversely affect the credibility of the TMC among operators at the MARTA TIC.

Supporting Findings

- The MARTA TIC had access to the IMS at the terminals of the Chief of Radio Communications and the managers. IMS was up and running during the first three days of the Olympic Games (Ref.: Section 3.3.2.2).
- Managers in the MARTA TIC used the IMS to enter incidents. One specific incident involved an accident on a major arterial **heavily** used by MARTA Bus for fixed-route service (Ref.: Section 3.3.2.2).
- On Day 4 of the Olympic Games, the IMS was no longer accessible to the MARTA TIC and remained unavailable for the rest of the games period. MARTA staff indicated that a software change made at a higher level of authorization (at the TMC) had left the system inaccessible to them (Ref.: Section 3.3.2.2).
- Managers at the MARTA TIC expressed disappointment in not being able to access the IMS for the remainder of the games. The IMS offered a real opportunity for the TMC and the TIC to communicate on incident issues (Ref.: Section 3.3.2.2).

Recommendation

- GDOT, in conjunction with other local agencies, should facilitate periodic team communications by creating a bulletin board or similar system.

Software **changes should be** conveyed to **operators at each control center** (TCCs and TIC), especially if they affect accessibility to the system. Communications regarding system software changes must be conveyed to all operators to promote their continued **cooperation** with data inputs and to realize the full benefits of the system.

4.2.2.9 Shared Use of Technology for Traffic Information Exchange

Lesson Learned

- The potential exists for even greater traffic information exchange between TMC and MARTA, and between MARTA and the TCCs, when the TCCs become fully operational.

Supporting Findings

- MARTA had incident management information but no practical means of sharing it with the TMC or the TCCs. While some of these incidents, particularly those on freeways, would eventually have **become known** to the

TMC, many of these were known to MARTA long before the TMC (Ref.: Section 3.311.7).

- During the games, the TCCs did not function as incident management centers, and operators did not log any incidents into the IMS database (Ref.: Section 3.3.2.3).
- CCTV cameras provided a new and unique perspective to transit surveillance, as well as assistance with incident response actions. They proved to be extremely valuable during the event period (Ref.: Section 3.3.4.1).
- MARTA TIC made extensive use of the CCTV cameras located on the Georgia Dome to help in the assignment of buses and to manage spectator movements (Ref.: Section 3.3.4.1).
- MARTA TIC has the ability to transmit and receive communications with the TMC through a direct phone line installed in the TIC communications room. However, this communications link was seldom used, due to TIC's unfamiliarity with it. All MARTA buses and OSTS buses had radio contact with MARTA TIC. This represented an enormous potential for expanding the incident detection network across the metropolitan area, particularly as MARTA TIC supervisors were keen to work with TMC to maximize system utility (Ref.: Section 3.4.1.2).
- The Chief of Radio Communications indicated that the CCTV camera system was extremely useful in locating and identifying vehicles that were broken down or involved in accidents while in service (Ref.: Section 3.5.1.3).

Recommendation

- GDOT **and** MARTA, in conjunction with other local agencies, should explore ways in which transit operations information can be used for freeway and surface-street management.

Incident management and transportation operations in general can be enhanced by the shared use of technology, such as radio reports from bus operators, and CCTV camera observations of traffic conditions.

4.2.3 Transit Management: ITS Technology Deployment

The four primary roles of ITS technologies for transit management are to:

- Provide pretrip planning information.
- Provide accurate real-time information to travelers.

- Monitor and optimize transit fleet operations.
- Automate maintenance monitoring.

In Atlanta, AVL, APC, and in-vehicle announcements were deployed on selected MARTA buses. Automated itinerary planning was also provided by the MARTA Customer Services department. In addition, ATC was deployed on MARTA Rail (Ref.: Section 4.2.9.2). While management, systems, operations, and maintenance of the OTS is the subject of a separate FTA review, the Event Study addresses some of the key lessons learned relating to OTS operations.

Lesson Learned

- There were clear indications during the games that ITS technologies offered the potential to enhance transit management. However, the APTS components require more time for full deployment and shakedown before they can be fully assessed.

Supporting Findings

- The effectiveness of the incident detection capability of the AVL system with respect to the overall fixed-route bus operation was not measurable during the games. Although bus dispatchers and operators received training on the use of this system, further use and experience is required to derive its full potential as a transit security and audio monitoring tool. During the games, the system offered significantly enhanced capabilities in the area of transit surveillance (Ref.: Section 3.3.4).
- Radio dispatchers in the MARTA TIC indicated that the AVL system was an effective addition to their communications center, for three key reasons: the ability to monitor and adjust bus service levels, the ability to monitor the mechanical functions of the vehicles, and the ability to monitor the safety of the operator and onboard passengers (Ref.: Section 3.5.1.3).
- MARTA TIC dispatchers felt that an opportunity existed to coordinate with the city of Atlanta to access the APD quickly when emergency situations were identified through the AVL system (Ref.: Section 3.5.1.3).
- MARTA staff indicated that the AVL system worked well but was frequently off-line due to system failures, which were attributed to its recent installation (Ref.: Section 3.5.1.3).
- Bus operators provided positive feedback about the potential uses of AVL and were enthusiastic about its ability to assist with their personal safety (Ref.: Section 3.5.1.3).

- Perceptions of operators and supervisors regarding the use of PARIS were positive, and all respondents expressed enthusiasm and interest in utilizing the full potential of the system when it is fully installed (Ref.: Section 3.5.1.3).
- Full implementation of the APTS components was not completed in time for the Olympic Games. For those that were operational, very little online testing and troubleshooting could be accomplished in the time available. Consideration should be given to a more comprehensive program of assessment when the APTS components are fully operational (Ref.: Section 3.5.5.2).

Recommendation

- FHWA and FTA, in conjunction with MARTA, should assess the performance of the ARTS components after a comprehensive shakedown period.

4.2.4 Regional Multimodal Traveler Information: ATIS Deployment

Timely, integrated traffic and transit information will facilitate informed transportation choices for a diverse range of users. Travelers may use this information for their personal needs, agencies may use it to support their operational needs, and private-sector businesses may derive commercial benefit from the information. In Atlanta, regional multimodal traveler information was primarily provided as part of the Atlanta TIS, which interfaced with GDOT's TMC. Traveler information was also available via kiosks, under FHWA's Atlanta Kiosk FOT, GDOT's *DOT call-in service, and MARTA's automated itinerary planning system.

Lesson Learned

- The games period only allowed a preliminary investigation of the role of ATIS components.

Supporting Findings

- The perceptions of operators and supervisors regarding the use of PARIS were positive, and all respondents expressed enthusiasm and interest in utilizing the full potential of this system when it is fully installed (Ref.: Section 3.5.1.3).
- Some ARTS components were not fully implemented in time for the Olympic Games. For the operational components, little online testing and troubleshooting was accomplished in the time available. Consideration

should be given to a more comprehensive program of assessment when the APTS components are fully operational (Ref.: Section 3.5.5.2).

- Only 11 percent of respondents used the MARTA customer service line for itinerary planning. Nearly 60 percent of those who did changed their travel pattern as a result (Ref.: Section 3.5.5.2).
- Nearly 85 percent of respondents did not notice any in-vehicle announcements, either on MARTA rail or bus services. Of those who did, the majority were on MARTA rail services (Ref.: Section 3.5.5.2).
- Awareness of the Internet site was high, but both the Internet and the kiosks had only a minimal impact on pretrip planning. This was due in part to the fact that both were targeted media, available only to particular groups of people (Ref.: Section 3.5.5.1).

Recommendation

- FHWA and FTA, in conjunction with local agencies, should assess the ATIS components after a comprehensive shakedown period.

While there were indications during the games that the ATIS components offered the potential to assist pretrip planning and provide enroute traveler information, components such as HAR, TATS, BBS, ADAS, in-vehicle announcements, and PIDs were not operational. Kiosks and the Atlanta TIS components were operational, but were new to Atlanta. The ATIS itinerary planning component was only available through MARTA Customer Services personnel and not through the kiosks as planned.

Although such components as the Atlanta TIS, kiosks, and ADAS are subject to separate evaluations, these are not all of the components that provide contact with the public. It is therefore impossible to form a clear view of the relative value or the greatest utility of these components to the traveling public. A detailed ATIS comparative review will allow the optimized deployment of the available technologies.

4.2.5 Traffic Signal Control: GDOT and Non-GDOT Signals

Signaling systems that can react to changing traffic conditions are an important component in improving overall transportation system efficiency. These systems require real-time data inputs from traffic sensors. Advanced signal systems can automate this process throughout the network, and can include a priority for emergency or transit vehicles. Ultimately, the electronic exchange of traffic data across jurisdictional boundaries will enable metropolitan areawide signal coordination, facilitating improved arterial traffic flows, as well as freeway diversions during incidents. In Atlanta, the primary traffic signal projects involved upgrading traffic signals in the city, and implementing a joint GDOT-city of Atlanta action team to develop and implement a wide range of signal timing plans during the games.

Lesson Learned

- Even when the ATMS is fully functional, it may be unable to achieve its full potential without agreements between GDOT and other transportation and incident management agencies.

Supporting Findings

- Agreements are not in place regarding GDOT controlling non-GDOT signals for incident management operations whenever TCCs are not staffed (Refs.: Sections 3.4.1.3 and 3.5.1.2).

Recommendation

- In conjunction with other local agencies, GDOT should develop agreements for the control of non-GDOT signals.

4.26 Electronic Fare Payment: Smartcards Utility

Electronic fare payment offers convenience to the traveler, and both cost savings **and** management information **to** transit agencies. Eliminating the need for transit **riders to carry change and providing** a single-payment medium for a wide range of transportation and other services will make transit services easier to use. For transit agencies, this will reduce cash-handling costs and provide real-time information about travelers and their travel patterns, at minimal costs. In Atlanta, Nations Bank, First Union Bank, Wachovia Bank, and VISA launched their smartcard to coincide with the games, entitling cardholders to ride MARTA and use the card at a variety of local outlets. The smartcards had a fixed stored value, which was decremented each time the card was used.

Lesson Learned

- The role of the Nations Bank, First Union Bank, and Wachovia Bank VISA smartcard as a transit fare medium was limited by virtue of the free access to MARTA public transit facilities available to spectators with a valid venue ticket. In addition, existing MARTA farecards offered discounts not available with the use of the smartcard.

Supporting Findings

- Only 1.9 percent of respondents used the smartcard for fare payment. At this rate, it was the least-used form of fare payment. Nearly 80 percent of respondents used their venue tickets to "pay" for transit use (Ref.: Section 3.5.5.2).

Recommendation

- If the smartcard is considered for full-scale implementation, FHWA and FTA, in conjunction with MARTA and GDOT, should assess the potential role of smartcards compared to other fare payment media during normal travel conditions.

As noted, the majority (80 percent) of passengers used their venue tickets for transit service, which was provided at no additional cost to ticketholders. This contributed to the small amount of smartcard usage for transit services during the evaluation period.

Several of the interviewees also commented that they did not have a need for the smartcard because they already possessed a standard credit card. In many cases, they were unclear regarding the benefits of the smartcard and could not distinguish the difference between it and standard credit cards. FHWA and FTA should **undertake a focused effort to assess** the impact of the smartcard in Atlanta for transit fare payment, in a controlled experiment during a nonspecial-event period. Both agencies should participate, since smartcards have the potential to support electronic toll **payment, automated** parking schemes, and other transit and travel components, as well.

4.2.7 Olympic and Paralympic Games Transportation Operations

There are no Atlanta perspective recommendations for this subject.

4.2.8 Travel Demand Management: Commute Options Plan

Lesson Learned

- Little is known regarding the long-term impacts of the Commute Connections Network (CCN) program and the extent to which the Atlanta ITS deployments facilitated the impacts.

Supporting Findings

- Travelers responded to the media campaign to reduce vehicle travel as a consequence of the TDM plan. Freeway tripmaking was spread to different times of the day, and peak demands were reduced by a significant percentage. Many commuters turned to MARTA or simply stayed away from the CBD of Atlanta (Ref.: Section 3.5.2.2).
- For Olympic Ring venues, nearly 90 percent of respondents used some form of transit to access the venues (Ref.: Section 3.5.5.2).
- The ACOG media campaign (conducted in conjunction with ARC) advised the public of the potential for gridlock during the games. This campaign was very successful in affecting the necessary discretionary travel changes. Evidence that the media campaign worked to reduce traffic relates to travel behavior as the games progressed. Because there were no major traffic tie-ups at the onset of the games, many travelers realized that driving was relatively hassle free. This was broadcast on the radio and television and printed in the newspapers. As the games progressed, more people appeared to be choosing to drive downtown, based on the broadcast information. To mitigate the growing traffic volumes, ACOG and GDOT reissued media requests to reduce congestion near the **CBD (Ref.:** Section **3.5.2.2).**
- **Freight** and TDM were well rated for performance and usefulness, but to a lesser extent for ease of implementation (Ref.: Section 3.6.3).

Recommendation

- ARC, in conjunction with local agencies, should assess the long-term impacts of expanding the CCN program.

It is clear that freeway traffic patterns through the downtown area were modified during the Olympic Games. The reasons for this cannot be specifically attributed to any single factor or group of factors, because this would have required a major evaluation exercise. However, the ACOG/ARC media campaign and the fact that Olympic Games ticketholders had free access to expanded transit services seem most likely to have had the greatest impact. In light of these observations, an expansion of CCN to address year-round congestion mitigation in the Atlanta region should be considered.

4.2.9 Other Infrastructure

4.2.9.1 HOV Lanes

Lesson Learned

- While public attitudes towards HOV lanes were positive, the impact of the HOV lanes during the games was neutral.

Supporting Findings

- Almost two-thirds of local freeway users believed HOV lanes were a good way to encourage carpooling (Ref.: Section 3.3.7).
- The HOV lanes had a neutral impact on transportation operations during the games, since they did not offer noticeably faster speeds than general-purpose lanes (Ref.: Section 3.3.7).
- Some bus operators were reluctant to use the HOV lanes, because of the **difficulty** of making multiple merge/weave maneuvers across general travel lanes (Ref.: Section 3.3.7).

Recommendation

- GDOT and ARC should consider ways in which the post-games use of the HOV lanes can be enhanced.

4.2.9.2 North Line Extension

Lesson Learned

- Little is known about the overall impact of the North Line Extension on travel patterns in the Atlanta metropolitan area.

Supporting Findings

- The North Line Extension with three new stations approximately doubled the throughput of trains traveling from Lindbergh Center Station through Five Points and beyond. The increased service helped considerably with the huge crowds and unprecedented rail ridership experienced by MARTA Rail during the Olympic Games (Ref.: Section 3.3.8).
- Rail ridership just before the games had increased by 140 percent compared to the first part of July, due in part to the opening of the North Line Extension (Ref.: Section 3.3.8).

- Staff indicated that the new train control system was extremely effective, with few problems experienced since startup operations in April 1996. Observations of the train control system at MARTA Rail Central Control at Avondale demonstrated that it was an effective tool for identifying and resolving rail incidents. The train control system also scored well for ease of implementation, performance, and usefulness (Refs.: Sections 3.3.4, 3.5.1.3, and 3.6.3).

Recommendation

- MARTA and ARC should assess the long-term impacts of the North Line Extension.

4.3 RECOMMENDATIONS SUMMARY: LOCAL ATLANTA PERSPECTIVE

In this section, the recommendations are presented according to their primary functional grouping: technical, operational, and institutional.

4.3.1 Technical Grouping

The technical grouping **includes** recommendations related to systems, services, and plans:

- **GDOT** should review its GDOT HERO deployment plans, and **assess the need** for and location of additional field devices, such as CCTV cameras and CMS, as part of a post-Olympics operations plan.
- GDOT should enhance the ATMS software to allow the tracking of operator performance.
- GDOT should review the icon placement process of the IMS to determine if hardware or software changes can further improve speed.
- FHWA and FTA, in conjunction with local agencies, should assess the performance of the ARTS components after a comprehensive shakedown period.
- FHWA and FTA, in conjunction with local agencies, should assess the ATIS components after a comprehensive shakedown period.
- If the smartcard is considered for full-scale implementation, FHWA and FTA, in conjunction with MARTA and GDOT, should assess the potential role of smartcards compared to other fare payment media during normal travel conditions.

- ARC, in conjunction with local agencies, should assess the long-term impacts of expanding the CCN program.
- GDOT and ARC should consider ways in which the post-games use of the HOV lanes can be enhanced.
- MARTA and ARC should assess the long-term impacts of the North Line Extension.

4.32 Operational Grouping

The operational grouping includes the development of operations planning and the deployment of applicable guidelines:

- GDOT should commence an ongoing analysis of incident clearance times.
- Because of the risks inherent in incident management activities, GDOT HERO operators should incorporate additional training emphasizing sensitivity to these factors.
- GDOT should implement measures to monitor HERO performance.
- GDOT, in conjunction with other local agencies should complete the library of response plans and the associated operator training.
- GDOT should review procedures for terminating level II and higher incidents when they are moved to the shoulder.

4.3.3 Institutional Grouping

The institutional grouping includes recommendations that focus on institutional coordination between agencies. This includes interagency operational barriers, team-building, and communications:

- FHWA, FTA, GDOT, ARC, the city of Atlanta, MARTA, and other local agencies should pursue and implement an integrated, multiagency approach to incident management operations.
- GDOT, in conjunction with other local agencies, should facilitate periodic team communications by creating a bulletin board or similar system.
- GDOT and MARTA, in conjunction with other local agencies, should explore ways in which transit operations information can be used for freeway and surface-street management.
- In conjunction with other local agencies, GDOT should develop agreements for the control of non-GDOT signals.

4.4 LESSONS LEARNED AND RECOMMENDATIONS: NATIONAL PERSPECTIVE

Lessons learned with a national perspective are based on the Atlanta lessons learned (Section 4.2). Additionally, Event Study findings that have relevance to other parts of the country, not just Atlanta, are also reported in this section. Each lesson learned is followed by a series of supporting findings, referenced to previous paragraphs in Section 3.0.

There are 19 recommendations that are generally transferable to a wider audience. Nine of these are in IT1 groupings. Most of the recommendations are related specifically to event management.

4.4.1 Freeway Management

4.4.1.1 Deployment of Field Devices and Patrol Resources

Lesson Learned

- Selecting an optimal mix of field devices and safety service patrol resources requires judgment to balance the desired functionality against the budget. Consideration must also be given to such factors as system integration, operations, and maintenance.

Supporting Findings

- GDOT HEROs provide an extremely flexible service for motorists, as well as at accident scenes (Ref.: Section 3.3.1.4).
- GDOT HEROs have achieved widespread acceptance from the public and from agencies involved in incident management (Ref.: Section 3.3.1.4).
- It is not possible to use existing TMC database systems to quantitatively evaluate the performance of the GDOT HEROs, or measure their impact on incidents (Ref.: Section 3.3.1.4).
- The top three methods of incident detection, CCTV, Metro Networks, and GDOT HEROs, represent resources or devices that had a specific incident detection role during the games. Together, they were the method of first reporting for nearly half the incidents detected (Ref.: Section 3.3.3.1).
- For incidents located within the perimeter, two-thirds were detected by CCTV, GDOT HEROs, and *DOT callers (Ref.: Section 3.3.3.2).

- For incidents located on and outside the perimeter, more than half were detected by Metro Network spotters, Atlanta TIS, and the TCCs (Ref.: Section 3.3.3.2).

Recommendation

- FHWA and FTA should coordinate the development of guidance for the deployment of field devices and safety service patrol resources to support individual agencies' decisionmaking processes.

Agencies considering the deployment of ITS technologies for freeway management are faced with a wide choice of available field devices to supplement their installed base of devices. Increasingly, safety service patrols are also being deployed across the nation. A new knowledge base is being established with each new deployment, but no guidance exists to support individual agencies' decisionmaking processes.

4.4.1.2 Implementation of Freeway Traffic Management Measures

Lesson Learned

- **GDOT successfully** implemented specific traffic management measures in **support of** its **objective to facilitate smooth** and safe traffic flow on critical sections of the freeway system during the Olympic Games.

Supporting Findings

- **GDOT was** prepared to take measures to encourage the use of HOV lanes **(Ref.:** Section 3.3.7).
- The **ACOG** media campaign, done in conjunction with ARC, cautioned the public of the potential for gridlock and was very successful in affecting the necessary discretionary travel changes. Evidence that the media campaign worked to reduce traffic relates to travel behavior as the Olympic Games progressed. Because there were no major traffic tie-ups at the onset of the Olympic Games, many travelers realized that driving was relatively hassle free. This was broadcast on the radio and television and printed in the newspapers. As the games progressed, more people appeared to be choosing to drive downtown, based on the understanding that traffic was relatively light. To mitigate the growing traffic volumes, ACOG and GDOT reissued the request that everyone avoid driving near the CBD (Ref.: Section 3.5.2.2).

Recommendation

- Well in advance of a major event, local agencies and event organizers should implement special traffic management measures where appropriate to support the overall objectives of event management.

4.4.2 Incident Management

4.4.2.1 Operator Performance

Lesson Learned

- Agencies planning ITS deployments would benefit from understanding the training requirements for such systems, including the duration and type of training.

Supporting Findings

- In most cases, learning to use the ATMS occurred on the job during the Olympic Games. TMC supervisors and operators commented that more training was needed (Ref.: Section 3.5.1.1).
- It was unfortunate that the system shakedown coincided with the Olympic Games. This did not allow enough time for staff training on the system (Ref.: Section 3.5.1.1).
- AlI TCC personnel felt that the training was welcome but not adequate, and that it would have been more helpful if it had been provided after the system was up and running (Ref.: Section 3.5.1.2).
- MARTA TIC supervisors received training at the TMC in the form of a l-day class. Training was brief, and the staff learned how to access and maneuver CCTV cameras through trial and error at MARTA TIC. More training was expected at some point in the future (Ref.: Section 3.5.1.3).

Recommendation

- FHWA and FTA should coordinate the development of guidance for ITS operational training requirements to support state and local deployments.

Planning for training requirements is essential for the success of ITS deployments. The experience in Atlanta was unusual. Unlike most ITS deployments, the games represented an immovable deadline. Slippage in deployment affected shakedown, which in turn impacted the training program. If not for the games, shakedown and training would probably have been delayed.

In Atlanta, the performance of TMC operators was impressive, despite the fact that the games period represented the shakedown period for the ATMS. TMC operators could not have any formal training, since the system was constantly being revised. Much of their training was on the job during the games period.

It is interesting to note the rate of improvement in operator performance in the TMC during the Olympic Games. In part, this may be attributed to the system itself, for which operator opinion has generally been favorable. This also suggests that a relatively short period of two or three weeks of training under real-world conditions can be sufficient to make operators conversant with the system. While this result does not counter the need for other forms of training, it highlights the value of practical experience.

4.4.2.2 Impact Monitoring

Lesson Learned

- The Atlanta regional ATMS does not currently possess the capability to monitor incident management effectiveness automatically. Similarly, the ATMS cannot be used for automatically evaluating the performance of the GDOT HEROs, or measuring their impact on incidents.

Supporting Findings

- An apparent improvement in mean time to clear incidents after incident verification, from 40.5 min to 24.9 min, was observed, despite reductions in the **operating** hours of GDOT HEROs and reductions in the staffing levels of TMC operators (Ref.: Section 3.3.1.2).
- The TMC is able to search the IMS database for incident trends, such as numbers, locations, types, and levels, but is unable to perform trend analyses of incident management (Ref.: Section 3.3.1.3).
- It is not possible to use existing TMC database systems to evaluate quantitatively the performance of the GDOT HEROs, or measure their impact on incidents (Ref.: Section 3.3.1.4).

Recommendation

- Local agencies should design ITS deployments to monitor automatically the improvements in incident management (or other services, as appropriate).

While FHWA and FTA require quarterly and sometimes monthly progress reports for ITS deployments, there is no ongoing requirement to provide performance indicators when the systems become operational.

The underlying objective of such a requirement is to provide quality data for: investment strategies for future federally funded projects, and design strategies for individual efforts. Such data would provide valuable information to FHWA and FTA for establishing a consistent nationwide database on the impact of ITS deployments. It would also assist funding recipients in optimizing their system performance. Consideration should be given to benchmarking each ITS deployment. Performance indicators to monitor results, and procedures for publishing those results, need to be identified. Results could include: incident response and clearance times, delay reductions, journey time improvements.

4.4.2.3 Interagency Coordination

Lesson Learned

- Relationships between agencies improved with the planning and implementation of the ATMS system, and the staff was enthusiastic about its capabilities. However, it was apparent that the full benefit of the system will not be realized without more interagency coordination, involving office and field-based operations.

Supporting Findings

- Currently, an initiative is under way by ARC for a new interagency approach to freeway incident management. An incident management handbook is being **developed** jointly by ARC and GDOT. It is understood this is currently pending a "launch" meeting. Implementation of such an approach, in conjunction with corresponding training, may improve interagency **coordination during major incidents (Ref.: Section 3.3.1.5).**
- **MARTA** had incident information that could only be shared with the TMC and the TCCs via telephone. While some of these incidents, particularly those on freeways, would eventually have become known to the TMC, many were known to MARTA for some period of time before the TMC (Ref.: Section 3.3.1.6).
- MARTA TIC has the ability to transmit and receive communications with the TMC through a direct phone line installed in the TIC communications room. However, this communications link was seldom used, because the MARTA TIC and the TMC were not accustomed to coordinating with each other (Ref.: Section 3.4.2.1).
- All MARTA buses and OSTS buses had radio contact with MARTA TIC. This represented an enormous potential to expand the incident detection network across the metropolitan area, particularly as MARTA TIC supervisors were keen to work with the TMC to maximize system utility (Ref.: Section 3.4.2.1).

- An incident management handbook is being developed jointly by ARC and GDOT. It is understood this is currently pending a "launch" meeting. Implementation of such an approach, in conjunction with corresponding training, will greatly improve interagency coordination during major incidents (Ref.: Section 3.4.2.3).
- Relationships with other agencies were improved with the planning and implementation of the ATMS system, in particular with 911 operators, police agencies, and the city of Atlanta (Ref.: Section 3.5.1.1).
- Since the introduction of the ATMS, coordination involving the city and counties, in the form of meetings at ARC or technical meetings at GDOT, was much greater. Many expressed the feeling that their input to the selection of the traffic signal control system had not been fully considered by GDOT (Ref.: Section 3.5.1.2).
- The staff indicated that CCTV cameras could be effective tools in resolving transit and roadway incidents, but more communication with the TMC and other TCCs was necessary to benefit fully from the system (Ref.: Section 3.5.1.3).

Recommendation

- Local agencies should ensure that the design of ITS deployments addresses the requirements of all agencies wishing to participate actively, while leaving the option for additional agencies to come on board at a later stage. Agency needs must be considered during the conceptual design stage.

At the conceptual design stage, the operational needs of all agencies must be established. This should include a description of the interagency communications and control strategies required. Specific issues regarding the control of one agency's facilities by another agency should be negotiated, together with multiagency traffic control strategies. System integration issues, such as incompatibility between different agencies' field devices, should also be identified. Finally, strategies for training, system familiarization, and operations should be agreed upon.

As the geographic and functional scope of ITS deployments increases, more agencies will become involved. These will share the relationships already in place and will demand new levels of interagency coordination.

4.4.2.4 Shared Technology

Lesson Learned

- Incident management and general transportation operations can be enhanced by the shared use of technology, including radio reports from bus operators, and the observation of traffic conditions using CCTV cameras.

Supporting Findings

- MARTA had incident information that could only be shared with the TMC and the TCCs via telephone. While some of these incidents, particularly those on freeways, would eventually have become known to the TMC, many were known to MARTA for some period of time before the TMC (Ref.: Section 3.3.1.6).
- Managers in the MARTA TIC used IMS to enter incidents into the data input page. One specific incident involved an accident on a major arterial heavily used by MARTA Bus for its fixed-route service (Ref.: Section 3.3.2.2).
- The CCTV cameras provided a new and unique perspective to transit surveillance and incident response assistance and proved to be extremely valuable during the event period (Ref.: Section 3.3.4.1).
- MARTA TIC also made extensive use of the CCTV cameras located on the Georgia Dome to help in the assignment of buses and the management of spectator movements (Ref.: Section 3.3.4.1).
- The TCC staff was very pleased to be participating in a regional incident management program, and was happy to have any new tools, such as CCTVs, to assist them in daily traffic management (Ref.: Section 3.5.1.2).
- The Chief of Radio Communications indicated that the CCTV camera system was extremely useful in locating and identifying vehicles that were broken down or involved in accidents while providing transit service (Ref.: Section 3.5.1.3).

Recommendation

- FHWA and FTA should jointly promote the concept of the shared use of technology and information between highway and transit agencies.

The TravInfo FOT in San Francisco, CA, and Transtar in Houston, TX, are two examples in which highway and transit agency information is pooled into a common system. For transit agencies, AVL and bus-operator radio call-ins are the primary data sources. For highway agencies, traffic detectors and CCTV cameras are the primary sources. The synergy between highway and transit agencies could be improved through increased data and technology sharing. There is a nationwide potential for the exchange of traffic information between highway and transit agencies.

4.4.3 Transit Management

There are no national perspective recommendations for this topic.

4.4.4 Regional Multimodal Traveler Information

4.4.4.1 Information Dissemination

Lesson Learned

- Selecting an optimal mix of traveler information systems (traditional and ATIS) requires judgment to balance the functionality desired against the budget. Consideration must also be given to such factors as system integration, operations, and maintenance.

Supporting Findings

- Travelers responded to the media campaign to reduce vehicle travel as a consequence of the TDM plan. Freeway tripmaking was spread to different times of the day, and peak demands were reduced by a significant percentage. Many commuters turned to MARTA, or simply stayed away from the CBD of Atlanta (Ref.: Section 3.5.2.2).
- Cable TV was the most heavily used ATIS component (Ref.: Section 3.5.4).
- Newspapers, radio and television reports were the most commonly used sources of pretip planning information. These sources were also rated highly in terms of their usefulness to travelers (Ref.: Section 3.5.5.1).
- The press disseminated important travel information both before and during the games (Ref.: Section 3.5.5.1).
- Internet awareness was high, but both the Internet and the kiosks had minimal impact on pretrip planning. This was due in part to the fact that both are targeted media, available only to particular groups of people (Ref.: Section 3.5.5.1).

Recommendation

- FHVVA and FTA should coordinate the development of guidance for the deployment of traveler information systems, to support individual agencies' decisionmaking processes.

In Atlanta, radio, television, newspaper, and TDM programs were the chief methods for distributing preevent transportation information for the Olympic Games. However, the games period allowed only a preliminary investigation of the relative roles of the traveler information components deployed. While Internet awareness was high, both the Internet and kiosks had only minimal impact on pretrip planning. Of the ATIS technologies deployed in Atlanta, Cable TV was the **most heavily used.**

Although such components as Atlanta TIS, the kiosks, and ADAS are subject to separate evaluations, these are not all of the components. It is therefore impossible to form an overall view of the relative values of these components to the traveling public. The development of guidance for the deployment of traveler information systems is focused on mainstreaming the use of such technologies. Such guidance should address cost and complexity issues, usefulness, benefits, operations, and maintenance.

4.4.4.2 Telephone Information Services

Lesson Learned

- Different agencies provide information on various services. Sometimes the public cannot easily determine which agency to call for a specific type of information.

Supporting Findings

- Before the games, many transportation agencies received calls requesting information regarding general travel, freight movements, Olympic Games venue schedules, and ticket information. On several occasions, it was clear that the agencies did not have the information, or even the correct number to calI (Ref.: Section 3.5.4).
- Significant staff time was appropriated, particularly at ARC, to answering a high volume of calls that were outside their transportation role. Many callers did not have the correct numbers to contact (Ref.: Section 3.5.4).
- ACOG was undergoing continued growth and personnel changes before the games. As they grew, personnel were transferred throughout the available office space, and phone numbers were constantly changing with the moves. This resulted in confusion among travelers calling for information (Ref.: Section 3.5.4).

Recommendation

- Local agencies and event organizers should jointly develop a "transportation information one-stop shopping" telephone line, with automatic transfers to appropriate agencies, not just the event organizer. This is particularly important for the successful organization of major special events such as the Olympic Games.

A single and easily recognizable telephone number should be available for all types of travel information during major special events. The line should have the capability to transfer calls directly to appropriate agencies. The services on this line should be coordinated with all of the agencies involved. This approach will reduce the number of inappropriate calls to all organizations. Also, the capacity of such a line should be sufficient to handle a large number of calls.

4.4.5 Traffic Signal Control: Timing Plans

Lesson Learned

- Where centralized control of traffic signals is not available, field signal operations teams can be very effective in making quick changes to signal timing plans to meet event flow needs. However, this will require reasonably accurate traffic demand forecasts.

Supporting Findings

- When the centralized traffic signal control system did not become operational prior to the games, the city of Atlanta and GDOT successfully fielded local action teams for implementing traffic signal timing changes in the field (Ref.: Section 3.4.1.2).
- Several changes to on-street traffic movement restrictions were made once the Olympic Games began, to facilitate improved traffic flow. The local action teams supported this role, in the absence of centralized control (Ref.: Section **3.4.1.2).**

Recommendation

- In the absence of centralized traffic signal control, local agencies should develop a quick-response action plan to handle real-time traffic flow needs during major events.

If the signal system coverage area is large, centralized control is highly desirable. This will reduce the amount of field labor required to operate the system.

The ability to respond quickly to real-time traffic conditions is resource intensive. It is important to have traffic surveillance capabilities on critical corridors during major events. The availability of real-time traffic surveillance capabilities allows signal operations personnel to develop responsive timing plans. Without traffic data, plans must be developed by estimation, resulting in a much longer trial-and-error period.

The ability to observe critical sections using **CCTV** cameras also provides excellent information in support of real-time traffic-signal timing changes.

If centralized signal control is not available, quick-response plans similar to the local action team model should be developed. Signal field-operations resources of GDOT and the city were combined to supplement the individual forces. Similar support from other agencies would have made the local action teams even more effective.

The quick-response action plan should also include swift detection of faulty or poor operations across the network. The regional incident management plan should include methods for relaying this information soon after it is noticed by bus operators, police, drivers, and other sources. This effort does not require an elaborate electronic system. Existing radios and mobile telephone communications would suffice.

4.4.6 Electronic Fare Payment

There were no national perspective recommendations for this topic.

4.4.7 Olympic and Paralympic Games Transportation Operations

This section covers a range of lessons learned pertaining to transportation operations during the games, including transit management, city street operations, and security impacts.

4.4.7.1 <u>ITS Deployments and Risk Management</u>

Lesson Learned

- Many components were either not fully operational or nonoperational during the games. In addition, most operational components were undergoing shakedown during the first week of the Olympic Games.

Supporting Findings

- The video imaging camera-based incident detection algorithm was not operational during the games. Incident detection and verification performance will improve further when the video imaging system is fully operational (Ref.: Section 3.3.1.1).
- Managers in the MARTA TIC expressed disappointment in not being able to access the IMS for the remainder of the games. IMS offered a real opportunity for the TMC and the TIC to communicate for the first time on incident issues (Ref.: Section 3.3.2.2).
- During the games, the TCCs did not function as incident management centers, and operators did not log any incidents into the IMS database (Ref.: Section 3.3.2.3).
- It is evident that the staff at all centers considers that the training received to date is inadequate for their needs. Perhaps because of the focus on the games, and the lack of full functionality in all centers, no training was given regarding the different ways in which each center planned to use the system (Ref.: Section 3.4.2.2).
- It was unfortunate that the system shakedown coincided with the Olympic Games (Ref.: Section 3.5.1.1).
- TCC personnel felt that the training was welcome but not adequate, and that it would have been more helpful if given when the system was up and running. The camera control software was easy to use, and the operators learned it quickly (Ref.: Section 3.5.1.2).
- The city of Atlanta abandoned their automated signal control system for the duration of the Olympic Games, because of frequent system crashes when they were trying to add traffic signals to the system, illustrating the difficulties that occur during system shakedown (Ref.: Section 3.5.1.2).
- The staff indicated that AVL worked well, it but was frequently off-line due to system failures, attributable to its recent installation (Ref.: Section 3.5.13).
- The AVL system was not utilized by the bus operators because the system was experiencing startup difficulties and was not completely operational (Ref.: Section 3.5.1.3).
- Full implementation of all APTS components was not completed in time for the Olympic Games. For those components that were operational, little online testing and troubleshooting was accomplished before the games. Consideration should be given to a more comprehensive program of assessment when the APTS components are fully operational (Ref.: Section 3.5.5.2).

Recommendation

- FHWA, FTA, and local agencies should develop contingency plans for ITS deployments associated with event management, to ensure that alternate means exist to provide event management services if an immovable deadline cannot be met.

While the factors behind these difficulties are part of the Atlanta Case Study, it is clear that the ITS planning process should consider contingencies when deadlines are immovable.

4.4.7.2 Special-Event Transit Operations Management

Lesson Learned

- In Atlanta, OSTS operations control was split between ACOG and MARTA. Conflict developed because ACOG wanted decisionmaking control of OSTS for **cost** reasons, **while** MARTA required significant decision input in order to operate OSTS effectively.

Supporting Findings

- The **organization of** OSTS was separate from that of MARTA. OSTS **was also colocated** with **ACOG** offices, and this led to unexpected organizational difficulties, such as:
  - Lower **priority of** the transportation function within ACOG's **organizational objectives.**
  - **Lack** of **transit** operational cultural exchange from MARTA Bus staff to the OSTS staff.
  - **Inability** of ACOG to transition OSTS effectively from planning to operations.

  (Ref.: Section 3.5.4).
- The conflict resulted in the delayed confirmation of major resource requirements, such as buses, drivers, terminals and Park **& Ride lots,** until shortly before the beginning of the Olympic Games. This delayed the OSTS startup operations and ruled out the testing of the OSTS system before the games commenced (Ref.: Section 3.5.4).
- Due to these conflicts, OSTS did not fully benefit from the **wealth** of transit operations experience of MARTA (Ref.: Section 3.5.4).

Recommendation

- Special-event transit operations should be managed under a single organizational umbrella (where feasible), preferably by local agencies that are familiar with the existing conditions.

It is recognized that ACOG, a private-sector organization, was responsible for planning and operating all aspects of the Olympic Games. Event transit operations fell under this organizational umbrella, and therefore the option of having local agencies manage transit operations was largely at ACOG's discretion. Other special events may offer the option for greater involvement of **local** agencies in event transit operations.

4.4.7.3 Pedestrian Conflicts

Lesson Learned

- During the games, no single agency was responsible for the integrated operation of pedestrian and bus movements.

Supporting Findings

- There were several locations where heavy pedestrian flows conflicted with OSTS shuttle bus movements. However, no agency was responsible for ensuring the efficient movement of spectator buses, as well as the safe movement of pedestrians. Such difficulties in the transportation system **could be overcome** with better interagency cooperation during planning and operations (Ref.: Section 3.4.1.1).

Recommendation

- Major event organizers and local agencies should plan for large numbers of pedestrians using traffic lanes.

Pedestrian volume forecasting is often considered unnecessary, because it is perceived that they do not pose a capacity problem. However, during special events, surges in pedestrian levels on transit systems warrant special planning to ensure safe and efficient pedestrian movements.

4.4.7.4 Communications

Lesson Learned

- Interagency coordination was carefully planned and rehearsed prior to the games. A notable exception was the cancellation of a multiagency planning exercise on the use of ITS deployments.

Supporting Findings

- With respect to operations planning during the games, a number of planning exercises took place at GDOT, ARC, and MARTA. Perhaps because of the lack of full functionality in all centers, there were no multiagency planning exercises on using the ATMS (Ref.: Section 3.4.2.2).

Recommendation

- Local staff, including DOTS, public transit operators, and event organizers, **should** participate in multiagency planning exercises on the use of ITS deployments prior to the commencement of major events.

System shakedown problems that occurred during the first week of the games **might have been avoided if sufficient time had been available to organize** multiagency planning exercises.

4.4.7.5 Venue Transportation Operations Management

Lesson Learned

- Venue transportation operations management is a challenging front-line role, frequently involving coping with unexpected events, and requires good communications with both spectators and staff.

Supporting Findings

- The venue personnel are not the same as the venue transportation personnel, but should be provided with the same information. The public cannot tell the difference between them and will ask questions of any official-looking person. (Ref.: Section 3.5.3)

- The Venue Managers and the Venue Transportation Managers should have a clear communications channel established between them. Have one piece of paper, updated as needed, with everyone's radio channel on it. . (Ref.: Section 3.5.3)

- Have enough radios and batteries. . (Ref.: Section 3.5.3)
- Use information from the camaras and the incident management system to communicate to the crowds at the venues. The crowds are more manageable when they understand why there is a delay. . (Ref.: Section 3.5.3)
- Camera coverage of MARTA loading zones would have been helpful. The Georgia Dome cameras were helpful in monitoring pedistrian flows at some venues. . (Ref.: Section 3.5.3)
- If necessary, recruit a knowledgeable rider on buses to assist unfamiliar drivers with navigation. . (Ref.: Section 3.5.3)
- Manage the expectations of management, spectators, and the public at large. . (Ref.: Section 3.5.3)

Recommendation

- Event organizers and local highway and transit agencies should consider how the management of venue transportation operations can support special events.

The role of venue transportation managers is to streamline the arrival and departure of spectators, minimize conflicts between pedestrians and vehicles, ensure safe transportation operations, and respond to circumstances as they arise. Good communications is therefore an important factor in such management, and ITS technologies may support venue transportation operations.

4.4.7.6 Media Relations

Lesson Learned

- The media can play a valuable role in disseminating traveler information, and can strongly influence public perceptions.

Supporting Findings

- The press disseminated important travel information both before and during the games (Ref.: Section 3.5.6).
- The roles and responsibilities of transportation agencies should be clear to the press and public. This will avoid confusion and possible negative attitudes toward transportation agencies that might linger after the games. The organizational differences between OSTS and MARTA were not clear to the

Atlanta press. During the first week of the games, bus problems were attributed to MARTA by the media, in part because the press could not differentiate between OSTS bus breakdowns (which accounted for most of the incidents) and MARTA Buses (which rarely used the freeways) (Ref.: Section 3.5.6).

- The press is generally inclined to report on negative situations and ignore the positive ones. It appears that alerting the press in advance could prevent reports from being negative (Ref.: Section 3.5.6).

Recommendation

- During major events, local highway and transit agencies and event organizers should disseminate timely and accurate transportation information through a combination of media sources and ATIS technologies to achieve widespread coverage.

The media often provide a public service, but they is collectively comprise businesses, each striving to maintain and increase their respective market share. While the management of media relations is important, it must be recognized that editorial control is the exclusive domain of individual newspapers, television, and radio stations. Providing timely updates to media representatives and keeping them "satisfied" is very critical to ensuring that their stories can be accurate. The management of expectations is another area worthy of attention by event organizers and local agencies prior to special events, so that the media can recognize (and broadcast) expected point-to-point travel times, as well as which agency is responsible in various situations.

Widespread market penetration of ATIS components appears to be the only available source for the comprehensive broadcast of accurate transportation information without possible media exaggerations.

4.4.8 Travel Demand Management

4.4.8.1 Uncertainty Planning

Lesson Learned

- Rail ridership was higher than forecast during the Olympic Games, necessitating changes to operating arrangements.

Supporting Findings

- On average, MARTA daily ridership was measured at approximately 0.9 million unlinked passenger trips, and occasionally reached nearly 1.2 million. MARTA planned around an expected daily ridership of 0.75 million, on Day 10 of the Olympic Games (Ref.: Section 3.5.2.1).

- With an actual level of demand occasionally exceeding that expected, by up to 0.45 million, some rail operating changes were inevitable during the first week of the games (Ref.: Section 3.5.2.1).

Recommendation

- Local agencies and event organizers should develop event travel demands forecasts that include a range for each mode (low, medium, and high). Operational plans should be drawn up for the range with the highest occurrence probability. Contingency plans should be drawn up to meet extreme levels.

The forecasting process should include a set of scenarios that creates a range of figures for each of the modes to be used for spectator transportation. Creating ranges is a **classic** method of dealing with uncertainty. The extreme ends of the ranges often seem improbable, yet this is a key to good planning. Having a range of forecasts allows contingency plans to be developed for each mode. In addition, two linked models are recommended. The first model, with only a few assumptions, can be used for two purposes: early system planning, and providing a check on a **more detailed model** that includes several more assumptions. More assumptions often lead to poor or inaccurate projections. Such a two-model approach provides greater insurance against poor projections.

4.4.8.2 Forecasting

Lesson Learned

- Forecasting is an inexact science. It depends on the interpretation of the outputs, as much as on the outputs themselves. Understanding the sensitivity of the forecasts to the assumptions on which they are based is essential.

Supporting Findings

- On average, MARTA Rail daily ridership was measured at approximately 0.9 million unlinked passenger trips, and occasionally reached nearly 1.2

million. MARTA planned around an expected daily ridership of only 0.75 million, on Day 10 of the Olympic Games (Ref.: Section 3.5.2.1).

- With an actual demand level occasionally exceeding the expected level by up to 0.45 million, some rail operating changes were inevitable during the first week of the games (Ref.: Section 3.5.2.1).
- Seven assumptions or factors that may have contributed to the lower-than-observed rail forecast were explored, although the actual impact of each assumption or factor could not be quantified (Ref.: Section 3.5.2.1).

Recommendation

- Local agencies and event organizers should work together to analyze the forecasts and their underlying assumptions prior to operations planning.

With ACOG and the other transportation providers intimately involved in the forecasting process, the influence of any one agency was potentially greater than that of the others. Each agency involved in forecasting brought its own biases to the process. Years of working in a particular area can contribute to such biases. Knowledge of resource limitations by the forecasting agencies can also add to such bias. An independent expert (a contractor or an in-house specialist not directly involved in model development), preferably with extensive transportation and special-event planning experience, can help to assure that these biases are filtered out of the process.

4.4.8.3 Commute Options Plan

Lesson Learned

- During major events, the traveling public can be persuaded, through a variety of measures, to use transit in large numbers and to adopt austere driving practices.

Supporting **Findings**

- The ACOG media campaign, done in conjunction with ARC, which cautioned the public of the potential for gridlock, was very successful in affecting the necessary discretionary travel changes. Supporting evidence that the media campaign worked to reduce traffic relates to travel behavior as the Olympic Games progressed. Because there were no major traffic tie-ups at the onset of the Olympic Games, many travelers realized that traffic congestion was not as bad as had been expected. This was broadcast on radio and television and was printed in the newspapers. As the games progressed, more people appeared to be choosing to drive downtown, based on the understanding that traffic was relatively light. To mitigate the growing traffic volumes, ACOG and GDOT reissued the request that everyone avoid driving near the CBD (Ref.: Section 3.5.2.2).

- Travelers responded to the media campaign to reduce vehicle travel, either directly or as a consequence of the TDM plan. Freeway tripmaking was spread to different times of the day and/or reduced by a significant amount. Many commuters turned to MARTA, or simply stayed away from the CBD of Atlanta (Ref.: Section 3.5.2.2).
- The press disseminated important travel information both before and during the games (Ref.: Section 3.56).

Recommendation

- Local agencies and event organizers should develop and implement a coordinated TDM approach for major events. This will mitigate congestion and reduce operational expenditures for the public and the agencies. The media campaign to publicize TDM must be organized to target all travelers in a comprehensive manner. This will maximize the benefits of the TDM Plan developed.

4.4.8.4 Freight Fleet Management Plan

Lesson Learned

- During the Atlanta Olympic Games, it was clear that the needs of the trucking and rail freight industry could be accommodated through prior planning and interagency cooperation.

Supporting Findings

- The truck and rail industries were pleased with the outcome of the freight management plan put in place during the games. All carriers interviewed subscribed to the view that they were "better safe than sorry" in planning for the games. It was also noted that extra costs to operate during the games were not unbearable. UPS and FedEx changed flight arrival and departure times to comply with freight restrictions (Ref.: Section 3.5.2.3).
- The success of the TDM plan contributed to successful freight operations. Freight and TDM were highly rated for performance and usefulness, but to a lesser extent for ease of implementation (Refs.: Sections 3.5.2.3 and 3.6.3).

Recommendation

- Local agencies and event organizers should develop a coordinated approach to freight fleet management for major events. Such plans have a **high** potential to be successful.

4.4.9 Other Infrastructure

There are no national perspective recommendations for this topic.

4.5 RECOMMENDATIONS SUMMARY: NATIONAL PERSPECTIVE

In this section, the event management and routine transportation operations recommendations are presented according to their primary functional grouping: technical, operational, and institutional.

4.5.1 Event Management

Technical Grouping

The technical grouping **includes** recommendations relating to systems services **and plans.**

- Local **agencies and event** organizers should jointly develop a "transportation **information one-stop** shopping" telephone information line, with automatic **transfers to appropriate agencies, not just to the event organizer. This is particularly important for the successful organization of major special** events **such as the Olympic Games.**
- Major event organizers and local agencies should plan for large numbers of pedestrians using traffic lanes.
- Event organizers and local highway and transit agencies should analyze how the management of venue transportation operations supports the special events.
- Local agencies and event organizers should develop event travel demands forecasts that include a range for several modes (low, medium, and high). Operational plans should be drawn up for the range with the highest occurrence probability. Contingency plans should be drawn up to meet extreme levels.
- Local agencies and event organizers should work together to analyze the forecasts and their underlying assumptions prior to operations planning.

- FHWA, FTA, and local agencies should develop contingency plans for ITS deployments associated with event management, to ensure that alternate means exist to provide event management services when an immovable deadline cannot be met.

Operational Grouping

The operational grouping focuses on event management transportation operations. This includes the development of operations planning and the deployment of guidelines.

- Local agencies and event organizers should implement special traffic management measures where appropriate, well in advance, to support the overall objectives of event management.
- In the absence of centralized traffic signal control, local agencies should develop a quick-response action plan to respond to real-time traffic flow needs during major events.
- During major events, local highway and transit agencies and event organizers should disseminate timely and accurate transportation information through a combination of media sources and ATIS technologies, to achieve **widespread coverage.**
- Local agencies and event organizers should develop a coordinated **TDM approach** for **major** events. This will mitigate congestion and reduce **operational expenditures** for the public and the agencies.
- Local agencies **and event** organizers should develop a coordinated approach to freight fleet management for major events. Such plans have a high potential to be successful.

Institutional Grouping

The institutional grouping includes event management recommendations that focus on institutional coordination between agencies. This includes interagency operational barriers, team-building, and communications.

- Special-event transit operations should be managed under a single organizational umbrella where feasible, preferably by local agencies that are familiar with the existing conditions.
- Local staff, including DOT personnel, public transit operators, and event organizers should participate in multiagency planning exercises on the use of ITS deployments, prior to the commencement of major events.

4.52 Routine Transportation Operations

Technical Grouping

The technical grouping includes recommendations relating to systems services and plans.

- FHWA and FTA should coordinate the development of guidelines for the deployment of field devices and safety service patrol resources, to support individual agencies' decisionmaking processes.
- FHWA and FTA should coordinate the development of guidelines for the deployment of traveler information systems, to support individual agencies' decisionmaking processes.

Operational Grouping

The operational grouping focuses on routine transportation operations. This includes the development of operations planning and the deployment of guidelines.

- **FHWA and FTA should coordinate the development of guidelines for ITS operational training requirements, to support state and local deployments.**

Institutional Grouping

The institutional grouping includes routine operations recommendations that focus on **institutional coordination between agencies. This includes interagency** operational barriers, team-building, and communications.

- Local agencies should design ITS deployments to monitor improvements in incident management (or other services, as appropriate) automatically.
- Local agencies should ensure that the design of ITS deployments takes into account the requirements of all agencies wishing to participate actively, while leaving the option for additional agencies to come onboard at a later stage. Agency needs must be considered during the conceptual design stage.
- FHWA and FTA should jointly promote the concept of the shared use of technology and information between highway and transit agencies.

4.5.3 Summary

The Event Study focused on the transportation operations during the Olympic and Paralympic Games in the city of Atlanta in 1996. Several of the resulting lessons learned and recommendations are therefore related to event management. These will be most relevant to locations hosting international sporting, political, and cultural events, including the 2002 Winter Olympic Games in Salt Lake City.

The lessons learned and recommendations are targeted at a wide range of agencies and at event organizers. At first, some of the IT1 groupings appear to be modally focused, e.g., freeway management and transit management. However, in metropolitan areas, the need for interagency coordination and the interaction between ITS technologies are such that agencies need to be aware of each others' operational requirements, goals, and future plans. These aspects of the Event Study may be particularly relevant to agencies currently associated with ITS model deployment initiatives.

4.6 NEXT STEPS

This report contains the findings and conclusions from the Olympic and Paralympic Games Event Study. In due course, the Final Report for the Atlanta Case Study will become available. It appears appropriate that further outreach should be undertaken in conjunction with the Case Study lessons learned and recommendations. Indeed, one of the key components of the Case Study is to make recommendations on how the ITS deployment experience can be disseminated to various audiences, ranging from Congress to the traveling public, using workshops, presentations, videos, etc. This approach has the benefit of presenting a total picture of the Atlanta experience, and avoids the potential confusion associated with disseminating information twice. It is already apparent that some of the lessons learned and recommendations from the Event Study potentially overlap those that are likely to be forthcoming from the Case Study.

REFERENCES

1. *Vision* 2020 *Baseline* Forecasts, Atlanta Regional Commission, June 1994,

2. *Event* Study Data *Management Plan,* Booz-Allen & Hamilton, July 1996.

3. *Olympic Spectator Transportation System (OSTS) Management, Operations, and Maintenance Review* Study, Booz- Allen & Hamilton.

4. *Atlanta Express Lanes-Market Strategies and Potential Utilization,* COMSIS Corporation, August 1996.

APPENDIX A
BOOZ-ALLEN & HAMILTON DAILY REPORTS

The following daily reports produced by BA&H reflect the major transportation occurrences observed by BA&H in the course of data collection activities. The daily reports include information regarding:

- Freeway and TMC operations.
- Transit system operations.
- TCC operations.
- Special actions.
- Additional comments.

Olympics Event Study
Daily Summary for Saturday, July 20,1996

- **FREEWAY and TMC OPERATIONS**
  - Traffic flow was generally good. Some congestion occurred at the Courtland exit from the I-75/1-85 southbound connector (into the downtown area) due to freeway exit closures throughout downtown Atlanta.
  - This is the first Saturday operation for the TMC. It is believed that the number of incidents encountered is less than usual.
  - Most incidents were vehicle breakdowns that did not affect travel lanes.
  - The following incidents were the most significant:
    - A bus broke down in the I-85 southbound express (HOV) lane. The response included posting a message on Changeable Message Signs and involved two HERO vehicles.
    - A flat-bed tow truck broke down in the I-85 northbound express (HOV) lane. The response included posting a message on Changeable Message Signs, and a message was broadcast on the highway advisory radio.
  - TMC responded to a request made by ACOG to broadcast a message via the highway advisory radio regarding occupancy at selected Park & Ride lots.

Booz-Allen & Hamilton, Inc.

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Olympics Event Study
Daily Summary for Saturday, July 20,1996

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- **TRANSIT SYSTEMS OPERATIONS**
  - The Olympic Transportation System commenced operation today.
  - The parking demand was accommodated at Park & Ride lots throughout the system, with spaces available at most locations.
  - MARTA responded to the same two incidents described above by issuing an "all-call" to their drivers to stay out of the HOV lane when and where it was blocked.
  - Most incidents were minor. The two most significant incidents that occurred were:
    - ACOG requested 100 buses from the MARTA spectator fleet for use to serve the opening ceremonies on Friday night. Delays occurred on Saturday morning at selected Park & Ride sites because the buses were not returned to the fleet until midmorning
    - A minor reroute was implemented Saturday afternoon after a MARTA driver reported a blocking accident at the Atkinson ramp. Buses were rerouted to the Riverside ramp until the accident was cleared.

Olympics Event Study
Daily Summary for Saturday, July 20,1996

- **ATLANTA TCC OPERATIONS**
  - All incidents reported were minor, including minor traffic signal malfunctions and a street lighting repair call.
  - The city of Atlanta continues to add traffic signals to their interconnected system. The process involved in adding signals to the system can limit their ability to operate.
- **SPECIAL ACTIONS**
  - No special actions were required today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Sunday, July 21,1996

- **FREEWAY and TMC OPERATIONS**
  - Traffic flow was generally good. Some congestion occurred at the Courtland exit from the I-75/1-85 southbound connector (into the downtown area) due to freeway exit closures throughout downtown Atlanta. (Stalled buses caused heavy congestion in the Courtland exit area in the early evening hours, as described below.)
  - Most incidents were vehicle breakdowns that did not affect travel lanes. Operators and supervisors felt that the number of incidents during the morning and afternoon was low.
  - The following incidents were the most significant:
    - In the early evening, two separate bus breakdowns occurred within 40 min of each other in the area of the southbound Courtland exit on the I-75/1-85 connector. Together, these two stalled buses created heavy congestion in the area. TMC responded to the first breakdown by dispatching two HERO vehicles and a wrecker. A Changeable Message Sign was also activated to advise drivers of upcoming congestion and lane blockage. TMC responded to the second breakdown by dispatching a wrecker. The HEROs continued to assist with traffic control. TMC also updated the message on the Changeable Message Sign to reflect an additional lane blockage.

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Olympics Event Study
Daily Summary for Sunday, July 21,1996

- **FREEWAY and TMC OPERATIONS (Continued)**
  - A tractor trailer lost part of its load on westbound I-20 west of I-285, blocking three lanes at first. GDOT maintenance crews responded and cleaned up the debris.
  - A motorist had a medical trauma, which caused him to crash into the the median barrier. (The motorist subsequently died at the scene.) The incident left the motorist's car in the HOV shoulder. The response by HERO vehicles, GSP, fire, ambulance and wrecker closed the HOV lane. Additional TMC response included posting messages on changeable message signs, and broadcasting an advisory on the highway advisory radio.
  - A bus stalled in the northbound HOV lane on I-85 near the Brookwood interchange, blocking the lane. The TMC responded by calling for a wrecker, which removed the bus. The TMC response included posting a message on the Changeable Message Sign.
- **TRANSIT SYSTEMS OPERATIONS**
  - The parking demand was accommodated at Park & Ride lots throughout the system, with spaces available at most locations.
  - MARTA rail ran smoothly on 2- to 3-min headways. Crowds at stations were well managed.

Olympics Event Study
Daily Summary for Sunday, July 21; 1996

- **ATLANTA TCC OPERATIONS**
  - All incidents reported were minor, including minor, traffic signal malfunctions. Signal repair technicians were dispatched in each case to make necessary repairs.
  - The city of Atlanta has temporarily stopped adding traffic signals to their interconnected system until a solution is implemented that allows new signals to be brought online without disrupting operations.
- **SPECIAL ACTIONS**
  - No special actions were required today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Monday, July 22,1996

FREEWAY and TMC OPERATIONS

- Congestion on the I-75/1-85 connector in the vicinity of the Courtland St. exit was greatly alleviated this evening due to a coordinated effort by GDOT and the city of Atlanta. The traffic management plan for the ramp terminal and vicinity was modified to allow operations without police manned traffic control. The modifications included lane reassignments (including a dedicated lane for off-ramp traffic), and retiming six traffic signals. GDOT further improved freeway operations by implementing a lane closure on the I-75/1-85 connector, which improved merge/weave operations. Also, the Changeable Message Sign was activated to advise motorists to use the Butler exit located to the south of Courtland.
- Traffic flow was fair overall but significantly heavier than on Sunday. Moderate to heavy congestion occurred throughout the morning and afternoon on the 1-mi section of the I-75/1-85 southbound connector ending at the Courtland Street exit. This congestion was due to traffic incidents in the area and freeway exit closures throughout downtown Atlanta. Intermittent bus stalls in the travel lanes in the early afternoon, combined with a full Olympic events schedule, produced heavy congestion throughout the afternoon.
- Vehicle accidents on and outside the I-285 perimeter and several bus stalls accounted for most of today's incidents.

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Olympics Event Study
Daily Summary for Monday, July 22,1996

- **FREEWAY and TMC OPERATIONS**
  - The following incidents were the most significant:
    - GDOT District Maintenance initiated a lane closure at 0730 on I-75/85 from the William's Street off ramp, to the Spring Street on ramp, to force traffic into the left three lanes past the Courtland Street off ramp. This allowed more weave area for on-ramp traffic and eased congestion during the morning in this area, which is proving to be the one recurring congestion area.
    - Two bus stalls in the travel lanes within 15 min of each other in the area immediately before the Courtland Street off ramp, coupled with heavy Olympic event traffic, caused a significant reduction in traffic speed and heavy congestion. Even though the buses were moved from the travel lanes within 20 min, the congestion problem continued most of the afternoon.

Olympics Event Study
Daily Summary for Monday, July 22,1996

- **TRANSIT SYSTEMS OPERATIONS**
  - The following incidents were the most significant:
    - A driver reported an accident in Fulton County and radioed in to MARTA TIC to determine if a reroute was necessary. Using the Incident Management Software, the incident was relayed to the TMC, which signaled receipt of the message.
    - A spectator bus stalled in a travel lane on southbound I-85 between Spring St. and Williams St. The driver called in to the Spectator Control Center, which passed the message on to MARTA. A service vehicle was dispatched by MARTA. A HERO vehicle arrived to assist with traffic control.
    - A spectator bus stalled in the HOV lane on southbound I-85 near Lindbergh. The driver called the Spectator Control Center, which called MARTA. MARTA dispatched a wrecker and advised a nearby bus to stop and pick up the passengers on the stranded bus. The stalled bus was restarted and the incident was cleared.
  - Yesterday (Sunday, July 21st), MARTA rail carried more than 600,000 passengers.
- **SPECIAL ACTIONS**
  - No special actions were required today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Tuesday, July 23,1996

- **FREEWAY and TMC OPERATIONS**
  - Traffic flow was fair overall, with traffic levels about the same as Monday. Traffic flows have been relatively light overall. The congestion on the I-75/1-85 southbound connector in the vicinity of the Courtland St. exit continued to be abated by the newly implemented traffic management plan. Moderate congestion (greatly reduced compared to weekend congestion levels) occurred at Courtland St. for about 1 h in the early morning period. This appears to be due to a surge in commute traffic hoping to arrive before the downtown Atlanta street closures are enforced. In addition, moderate congestion occurred intermittently during the afternoon and early evening when several Olympic events are scheduled to begin or end.
  - Vehicle accidents on and outside the I-285 perimeter and several bus stalls accounted for most of today's incidents.
  - The following incidents were the most significant (Most notable about the following two bus incidents was the very quick response time by all agencies involved.):
    - A bus stalled in the southbound HOV lane on the I-75/1-85 southbound connector in the vicinity of Spring and Courtland Streets. GDOT responded by posting a message on the Changeable Message Sign indicating that the HOV lane was blocked. The bus passengers were transferred to another bus, and the stalled bus was removed from the freeway by a wrecker.

Olympics Event Study
Daily Summary for Tuesday, July 23,1996

- **FREEWAY and TMC OPERATIONS (Continued)**
  - This was the first day that the TMC was called on to respond to multiple blocking incidents that were dispersed throughout the region, but occurred within a short time of one another. TMC notified the FHWA/GDOT Resource Table to stand by. The Resource Table member's purpose is to assist TMC in resource allocation among multiple incidents and to ensure other affected agencies, such as ACOG, are involved. Ultimately, the Resource Table was not convened. The following three incidents were the most significant occurring during this tirne:
    - A bus stalled in the center travel lane of northbound I-85 near the N Druid Hills interchange. The GSP helicopter was dispatched to provide a live camera feed. A GDOT camera operator was stationed on the helicopter. A message was activated on the nearby Changeable Message Sign, and a HERO vehicle assisted with traffic control until the bus was cleared.
    - A three-car accident on southbound I-85 just north of I-285 resulted in blocking three center travel lanes. The GSP helicopter was requested to move to this incident, which was outside of TMC CCTV camera range. A HERO vehicle was dispatched to assist with traffic control.
    - As the GSP helicopter was returning to base, they spotted a bus engulfed in smoke on the shoulder of eastbound I-20. They relayed the information via live camera feed to the TMC. A HERO vehicle was dispatched, which blocked the adjacent travel lane.

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Olympics Event Study
Daily Summary for Tuesday, July 23,1996

- **FREEWAY and TMC OPERATIONS (Continued)**
  - A bus stalled as it was merging onto the southbound I-75/1-85 connector between Spring and Courtland Streets. A HERO vehicle and a GDOT maintenance vehicle arrived to assist with traffic control. A message was posted on the Changeable Message Sign indicating that the lanes were blocked. A wrecker arrived and removed the bus from the freeway.
  - There was a car on fire on the shoulder of northbound I-75 near the I-285 interchange. The fire department responded irnmediately. A GSP vehicle arrived and closed the adjacent travel lane. A message was posted on the Changeable Message Sign indicating that there was a lane closure.
- **TRANSIT SYSTEMS OPERATIONS**
  - There were no significant incidents affecting the MARTA transit system beyond those reported above. All other incidents involving bus breakdowns were minor.

Olympics Event Study
Daily Summary for Tuesday, July 23,1996

- **FULTON COUNTY TCC OPERATIONS**
  - The Fulton County TCC has had connectivity with the TMC since Thursday, July 18th.
  - Fulton County TCC functions as a communications hub for the County. Unlike the Atlanta TCC, Fulton County does not have their own CCTV system or remote signal control, nor do they perform dispatch functions. They do have monitors, and they share CCTV feeds with the TMC.
  - The staff at Fulton County TCC has been actively using the CCTV monitors to monitor traffic conditions. They have been relaying incidents on GDOT facilities directly to the TMC.
- **SPECIAL ACTIONS**
  - No special actions were required today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Wednesday, July 24,1996

- **FREEWAY and TMC OPERATIONS**
  - Traffic flow was good most of the day except for short congested periods during the early afternoon. On the first day of events at the Stone Mountain venue just to the east of Atlanta, several hours of heavy congestion (with no incidents) were monitored at the intersection of I-285 and US-78.
  - A few vehicle accidents disrupted the morning and evening commutes, as described below. Fewer bus stalls and breakdowns were evident today compared to the past several days.
  - The following incidents were the most significant:
    - A two-vehicle accident on the I-75/85 connector northbound south of the CBD slowed traffic during the morning commute. The two center lanes were blocked for about 20 min. The incident, however, did not seriously affect the rest of the morning traffic.
    - A congestion incident was declared in the early afternoon, but moderate traffic and a low-key response using Changeable Message Signs cleared the incident in about 10 min.

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Olympics Event Study
Daily Summary for Wednesday, July 24,1996

- **FREEWAY and TMC OPERATIONS (Continued)**
    - The most significant accident occurred during the afternoon commute on the I-285 perimeter, east of the metropolitan Atlanta area. A three-vehicle accident closed the four right lanes, resulting in a fire. The accident was reported by a Metro Networks' spotter, and verified by a TMC slow-scan camera. A HERO unit was dispatched, together with two GDOT District 7 support vehicles. Also in attendance was a helicopter. All but one right lane were cleared and reopened within 50 min.

- **TRANSIT SYSTEMS OPERATIONS**
    - No report available.

Olympics Event Study
Daily Summary for Wednesday, July 24,1996

- **COBB COUNTY TCC OPERATIONS**
  - The Cobb County TCC is not yet operational, or linked to the TMC.
  - Cobb County is in the process of installing 22 CCTV cameras on county roads.
- **SPECIAL ACTIONS**
  - No special actions were required today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Thursday, July 25,1996

- **FREEWAY and TMC OPERATIONS**
  - Traffic volumes today appeared to be fairly similar to those on the past several weekdays. However, heavy rain showers contributed to several incidents in the early afternoon, leading to areawide moderate congestion that remained until early evening.
  - The majority of incidents were minor accidents and stalls that caused little disruption to traffic flow.
  - The following incidents were the most significant:
    - A media contact reported an overturned vehicle in the center lane on the northbound I-75/1-85 connector in the Atlanta central district. Three center lanes were blocked while GDOT cleared the incident. The TMC activated the Changeable Message Signs, warning of upcoming congestion and lane blockage. The backup extended to the I-75/SR 166 interchange to the south. Several Changeable Message Signs were activated until the congestion cleared.
    - As stated above, heavy rain storms contributed to several incidents. At least seven incidents were active simultaneously during this period. Most incidents were cleared in less than 30 min. However, the rain and the incidents produced residual congestion that remained through most of the day.
    - A lane-blocking incident occurred on southbound I-85 just north of the merge with I-75. The TMC responded by dispatching HERO vehicles and activating messages on the Changeable Message Signs.

Olympics Event Study .
Daily Summary for Thursday, July 25,1996

- **TRANSIT SYSTEMS OPERATIONS**
  - Early this morning, a two-car MARTA train left the tracks at the end of the East Line at the Indian Creek station. No passengers were on the train at the time. The accident did not affect MARTA train system operations. The cause of the incident is not known.
  - MARTA bus systems were running well, with no significant incidents to report. today.
- **GWINNETT COUNTY TCC OPERATIONS**
  - The Gwinnett County TCC was linked to the TMC camera system yesterday afternoon. They also connected 10 county camaras to the system. The incident management link to the TMC is not yet operational.
  - Gwinnett County is functioning as a communications hub for traffic management within the county. They do not perform dispatch functions from the TCC.
  - Today, 3 of 10 county CCTV cameras had overheating problems that caused them to shut down automatically.
  - The operators have been monitoring traffic via their own and TMC cameras, and forwarding incident information to the TMC via phone.

Olympics Event Study
Daily Summary for Thursday, July 25,1996

- **CLAYTON COUNTY TCC OPERATIONS**
  - The Clayton County TCC is not yet fully operational, or linked to the TMC. They have three Changeable Message Signs and 25 CCTVs, which will be linked together at the TCC.
  - Clayton County is looking forward to remote signal control capabilities coming online, capabilities that are currently not available to them.
- **SPECIAL ACTIONS**
  - The presidential motorcade today caused no significant disruption to traffic operations in the area.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

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Olympics Event Study
Daily Summary for Friday, July 26,1996

- **FREEWAY and TMC OPERATIONS**
  - Today's traffic volumes were noticeably heavier than the past few days, due to a very full Olympic events schedule and to the public's increasing use of the highways. In spite of heavier volumes, there were no significant incidents in the downtown area. The TMC did post Changeable Messages Sign (CMS) messages before the connector and outside the perimeter, to warn of heavy traffic volumes through downtown.
  - The few downtown incidents were minor and caused little disruption to traffic flow. Several more-significant incidents occurred outside the I-75/85 connector, as described below.
    - An accident on GA400 at I-85 blocked the left lane on GA400 for about 1 h. The TMC responded by posting CMS messages. No automated response was generated by the IMS software, since GA400 is not yet included in the IMS database.
    - The most serious incident occurred on I-85 northbound north of I-285. A tractor trailer and a mobile home were involved in an accident that jackknifed the mobile home and caused the tractor trailer loaded with bulk cement to plunge down an embankment off the right side. The mobile home came to rest cross-wise on the interstate, completely blocking five of the six lanes. All traffic was blocked while GDOT and local authorities responded to the emergency. The TMC called for helicopter surveillance to help assess the situation. Traffic was diverted to a frontage road and CMS messages were posted on I-85 and I-285 while emergency personnel freed the trapped tractor trailer driver and medics evacuated him to the hospital by

- **FREEWAY and TMC OPERATIONS (Continued)**

air. GDOT crews spread sand, and large wreckers called by the GSP dragged the mobile home to the shoulder. Traffic flow on four lanes was restored after approximately 1 h but occasional momentary traffic halts continued during the afternoon while crews recovered the wreckage of the tractor trailer. Full traffic flow was restored to I-85 approximately 6 h after the accident, although congestion continued for about another hour. MARTA commented that a pre-programmed reroute plan was not available. (Since the incident was outside the perimeter, no preprogrammed plans exist yet.) GSP ordered a specific reroute to MARTA transit via Buford Highway.

  - A fire in a motor home briefly closed two lanes of I-75 southbound. The TMC responded by posting messages on appropriate CMSs.

- **TRANSIT SYSTEMS OPERATIONS**
  - There were several incidents today involving MARTA buses. Most incidents were stalls that did not block travel lanes.
  - The most significant incidents were:
    - A bus stalled on the shoulder of westbound I-20 near Riverside. The driver phoned into MARTA TIC and a maintenance truck was dispatched. The maintenance person came upon a second bus also stalled on the shoulder near the original call. He mistook it for the first call and left the area after restarting the second bus. The first bus driver radioed in almost 2 h after his original call requesting service. The shift change of the maintenance fleet occurred around the time of the second call. This delayed response

Olympics Event Study
Daily Summary for Friday, July 26,1996

- **TRANSIT SYSTEMS OPERATIONS (Continued)**

  further. In total, the original bus was stalled on the shoulder for almost 3 h. The operator was able to restart the bus before maintenance arrived and drove it to the terminal.

  - A bus stalled on the southbound I-75/1-85 connector near the North Avenue exit, making it to the shoulder. MARTA TIC dispatched a maintenance vehicle to the scene. Shortly thereafter, a second bus stalled in the second travel lane on the southbound I-75/I-85 connector just south of the first incident. MARTA TIC immediately rerouted the maintenance vehicle to the more serious lane-blocking incident, which resulted in very fast response and clearance times.

  - Overall, MARTA system operations were very good today, with service operating at nearly 100 percent of schedule.
  - A call from the TMC alerted MARTA that the K-Mart parking lot (which is used to shuttle spectators to the Stone Mountain venue) had 1200 cars in it, when only 600 were expected. MARTA rerouted buses to serve the unexpected overflow, but some delays were experienced. MARTA contacted ACOG via the SCC and the events at Stone Mountain were delayed to accommodate the late spectators.
  - MARTA changed their service plan to remote parking locations. Originally, each parking lot was served by buses dedicated to an individual parking lot. Now, buses serve several parking lots that are near each other. This operation has improved headways and rider perceptions, and helped to manage service better.

Olympics Event Study
Daily Summary for Friday, July 26,1996

- **DE KALB COUNTY TCC OPERATIONS**
  - De Kalb County TCC used the newly operational ATMS to follow the major highway incident of the day (the tractor trailer-mobile home accident) on camera from their control center. The TCC personnel adjusted their signal timings to help deal with the increased arterial and street traffic due to the incident. They communicated with the TMC and proposed a traffic diversion, but the TMC felt their proposed diversion was unnecessary.
  - TCC personnel expressed their support and enthusiasm for the ATMS, and they look forward to its complete implementation.
- **SPECIAL ACTIONS**
  - No special actions today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Saturday, July 27,1996

- **FREEWAY and TMC OPERATIONS**
  - Today's traffic volumes were lighter than those on the weekdays, and similar to last weekend's volumes. It had been expected that this weekend's volumes would exceed last weekend's, but the closure of Centennial Park and the morning rain showers likely produced smaller crowds.
  - In the late afternoon, there was heavy congestion of the I-75/1-85 connector northbound in the vicinity of the Fulton County and Olympic Stadia. TMC responded by displaying Changeable Message Signs, and the GSP helicopter was dispatched to provide additional surveillance.
  - The number of incidents today was fairly low, with none producing heavy congestion.
  - TMC continues to improve their communications, coordination, and response times as they become more familiar with the system. Today, TMC coordinated with Atlanta TCC regarding congestion at the Martin Luther King southbound off ramp from the I-75/I-85 connector.

Olympics Event Study

Daily Summary for Saturday, July 27,1996

- **TRANSIT SYSTEMS OPERATIONS**
  - There were some intermittent MARTA rail station closures today. Information on how MARTA responded to passenger demand in light of the closures will be provided in tomorrow's report.
  - The number of incidents involving MARTA buses was fairly low today. Most incidents were stalls that did not block travel lanes.
  - 100 additional school buses arrived today to support the spectator system fleet. These buses will assist in responding to contingencies, such as breakdowns, event times changes, and unexpected heavy spectator loads. For example, the Atlanta beach venue was closed this morning by the police and fire departments because the event was oversold, resulting in overcrowding of the viewing stands. MARTA was able to respond quickly to this contingency and return the spectators to the parking sites.
- **SPECIAL ACTIONS**
  - No special actions today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Sunday, July 28,1996

- **FREEWAY and TMC OPERATIONS**
  - Today's traffic volumes were moderate to heavy from the morning to the early afternoon on the southbound I-75/1-85 connector. Traffic volumes were fairly light on the rest of the freeway system all day.
  - Congestion was the most significant problem on the southbound I-75/1-85 connector in the Spring St./Courtland St. vicinity. The congestion was due in part to street closings and restrictions for the women's marathon, and in part to the size and nut-nber of events at the stadia and downtown venues. In response to the congestion, the TMC and GSP initiated a closure of the right travel lane from Williams to Spring St. at 9:45 a.m. Shortly thereafter, they closed the Courtland St. exit. These actions allowed athlete buses to enter the connector via Spring St. At 10:30 a.m., they reopened the ramp and the lane.

    In the afternoon, heavy volumes caused traffic to back up from the southbound I-75/1-85 connector Courtland St. exit onto I-85 southbound Monroe Drive. Shortly before 3:00 p.m., TMC and GSP decided to close the righthand lane again from Williams St. to Spring St., which remained in effect until the early evening. The TMC posted messages on the Changeable Message Signs on I-85 at Pleasantdale Rd (outside the I-285 perimeter), advising motorists traveling through the city to use the I-285 perimeter.

Olympics Event Study
Daily Summary for Sunday, July 28,1996

- **FREEWAY and TMC OPERATIONS (Continued)**
  - The most significant incident was:
    - At noon, heavy rain contributed to a chain-reaction accident involving 26 vehicles on eastbound I-285 at Roswell Rd. GSP opened two lanes within 15 min. TMC activated Changeable Message Signs, advising of the congestion, and dispatched HEROs to assist with traffic control. The accident was cleared to the shoulder within 45 min.
- **TRANSIT SYSTEMS OPERATIONS**
  - No report from MARTA today. The information regarding responses to intermittent closures is deferred.
- **ATLANTA TCC OPERATIONS**
  - The Atlanta TCC continues to operate without remote signal control capability.
  - The pan/tilt/zoom control was activated on three cameras in the Northside Drive area, improving surface-street traffic monitoring and response in the Georgia World Congress Center and Georgia Dome vicinity.

Olympics Event Study
Daily Summary for Sunday, July 28,1996

- **SPECIAL ACTIONS**
  - No special actions today.
- **ADDITIONAL COMMENTS**
  - Plans were made today to prepare for the potential of heavy traffic volumes tomorrow. TMC and ACOG again asked the broadcast media to advise travelers to use public transportation. Additional plans have been developed and coordinated to close lanes on the southbound I-75/1-85 connector, the Courtland St. exit, southbound I-75, and southbound I-85, if congestion warrants such closures in the interest of traffic safety and congestion mitigation.

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Olympics Event Study

Daily Summary for Monday, July 29,1996

- **FREEWAY and TMC OPERATIONS**
  - The GDOT and the GSP correctly anticipated heavy traffic and implemented a previously developed plan before the morning rush hour began. This plan consisted of closing the rightmost lane at three different locations on southbound I-85 and the I-75/I-85 connector. The closures had the effect of causing heavy congestion and slower traffic speeds upstream of the normal choke points downtown. This congestion was compounded by a series of stalls and minor accidents throughout the day.
  - The plan permitted the Spring St. on-ramp and the Courtland St. off-ramp to flow relatively freely throughout the day. One of the lane closures was lifted in midmorning, but the others remained in place throughout the day. The plan was considered so successful that it will likely be continued during the rest of the week.
  - Traffic volumes on the southbound I-75/1-85 connector were heavy for much of the day. Traffic volumes were light to moderate all day on the rest of the freeway system.
  - Significant incidents today included:
    - A two-vehicle accident occurred on the ramp connecting the southbound connector to eastbound I-20. The vehicles were cleared rapidly. GDOT District 7 maintenance called a truck to apply sand to absorb fuel that was found in the area.
    - A four-vehicle accident blocked two lanes on the northbound connector at Central Avenue (south of downtown). The TMC responded by sending HERO units to the scene and posting Changeable Message Sign messages.

Olympics Event Study
Daily Summary for Monday, July 29,1996

- **FREEWAY and TMC OPERATIONS (Continued)**
    - A single-car accident resulted in a fire that blocked the two leftmost lanes (including the HOV lane) on the southbound connector before 14th St. TMC dispatched a HERO unit and posted advisories on the Changeable Message Signs. District 7 maintenance supplied a sand truck to apply sand to the highway spill caused by extinguishing the fire.
  - A number of stalls in the HOV lanes were responded to by using the Changeable Message Signs located directly over that lane.
  - In a number of stalls, HERO vehicles were used to push vehicles out of the travel lanes.
- **TRANSIT SYSTEMS OPERATIONS**
  - MARTA operations were typical for Olympics event days.
  - MARTA responds to intermittent rail station closures by trying to decrease headways to clear crowds as soon as possible. If delays are long, they are communicated to the Spectator Communications Center so that ACOG can determine if event times should be modified. MARTA security provides crowd control at the stations.
  - Most incidents today were stalls that did not block travel lanes. One bus did stall in the center lane of the southbound I-75/1-85 connector near Courtland St. and was moved to the shoulder within 15 min.

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Olympics Event Study
Daily Summary for Monday, July 29,1996

- **ATLANTA TCC OPERATIONS**
  - The Atlanta TCC has compensated for the lack of remote signal operation capability by deploying “local action teams.” The teams are made up of GDOT traffic signal technicians and a consultant who works with signal timing plans. The signals are adjusted manually in the field by the teams. Several signal timing plans throughout Atlanta have been modified to provide improved traffic flow for the Olympics.
- **SPECIAL ACTIONS**
  - No special actions today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Tuesday, July 30,1996

- **FREEWAY and TMC OPERATIONS**
  - Today, the GDOT and the GSP implemented the same morning rush hour plan as yesterday. This plan consisted of closing the rightmost lane at three different locations on southbound I-85 and the I-75/1-85 connector. The closures had the desired effect, permitting the Spring St. on - ramp and the Courtland St. off - ramp to flow freely throughout the day.
  - On the southbound I-75/1-85 connector between Brookwood and Courtland St., traffic was moderate to heavy during the morning rush and moderate over the noon rush. The southbound connector became very congested as a result of an accident during the early afternoon (see below), and it remained very congested until the early evening.
  - Traffic volumes were moderate all day on the rest of the freeway system.
  - Significant incidents today included:
    - During the morning rush hour, an accident occurred in the shoulder of I-285 southbound west of the city. The two rightmost lanes were closed by GSP immediately after the accident. Later, all lanes were closed briefly to evacuate an injured motorist by helicopter. The TMC posted advisories on the Changeable Message Signs in the area and dispatched maintenance crews to help clean up the incident and control traffic.

Olympics Event Study
Daily Summary for Tuesday, July 30,1996

- **FREEWAY and TMC OPERATIONS (Continued)**
    - In the early afternoon, a three-car accident occurred in the center lane on the southbound I-75/1-85 connector at 10th St. The TMC dispatched HERO vehicles to control traffic and posted messages on the Changeable Message Signs upstream of the incident. The TMC also called ambulances to assist and wreckers to clear the scene. HEROs arrived and closed off two more lanes (including the HOV lane) to allow the ambulance and wreckers access to the accident. The lane closures produced heavy congestion on the southbound connector that extended to southbound I-85.

- **TRANSIT SYSTEMS OPERATIONS**
  - Most incidents today were stalls that did not block travel lanes. The most significant incidents were:
    - Midmorning, De Kalb Police notified MARTA of a stalled bus in the rightmost lane on southbound I-85 near Shallowford. The Spectator Communications Center dispatched a maintenance vehicle, and a contract tow truck was called in. Before either of these arrived, a HERO vehicle had pushed the bus to the shoulder.

Olympics Event Study
Daily Summary for Tuesday, July 30,1996

- **TRANSIT SYSTEMS OPERATIONS (Continued)**
  - Midmorning, the Olympic Center manager contacted Spectator Communications to report that approximately 40 buses were sitting in traffic unable to reach the venues. A MARTA bus operator radioed in to MARTA TIC to note that a traffic signal was not functioning, which was the main reason for the delays. TMC was contacted by Spectator Communications. Atlanta police arrived to direct traffic at the intersection, and traffic was cleared shortly thereafter.

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- **ATLANTA TCC OPERATIONS**
  - There were no significant incidents to report from the Atlanta TCC.
  - 21 of Atlanta's 30 planned cameras are now connected to the system; 9 of these 21 are fully operational.
- **SPECIAL ACTIONS**
  - No special actions today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Wednesday, July 31,1996

- **FREEWAY and TMC OPERATIONS**
  - GDOT and GSP again implemented the traffic management plan used during the last two days. Although general congestion was somewhat less than the past two days, there were many incidents. Most incidents were vehicle stalls and minor accidents. A few more serious accidents are described below.
  - Congestion on the southbound I-75/1-85 connector between Brookwood and Courtland St. was moderate to heavy for about 1 h during the morning rush and again during the afternoon. CMS messages were posted in the afternoon on southbound I-75 and I-85 north of the I-285 perimeter advising motorists to avoid traveling through downtown.
  - Traffic volumes were moderate to heavy on the northern half of the I-285 perimeter throughout the afternoon, particularly in the southbound direction. A series of incidents during the evening rush increased congestion in this section.
  - Significant incidents today included:
    - Two vehicles were involved in an accident early in the morning rush hour on southbound I-75 south of the connector. There were minor injuries and police and ambulance were called. The TMC sent a HERO unit and posted CMS messages. The incident was cleared after about 1 h.
    - Late in the morning, a vehicle was abandoned on westbound I-285 south of the city, blocking the left two lanes and causing congestion. A HERO unit responded and the TMC posted a CMS message. The lanes were cleared in a l/2 h.

Olympics Event Study
Daily Summary for Wednesday, July 31,1996

- **FREEWAY and TMC OPERATIONS (Continued)**
  - Shortly after noon, two successive incidents occurred on northbound I-85 in Gwinnett County. The first was a two-vehicle accident with injuries. Two lanes of the I-85 were blocked and this incident created heavy congestion. About a 1/2 h later, one of the cars stopped in the congestion caught fire. The GSP closed all lanes of the freeway temporarily to fight the fire. Two righthand lanes remained closed to remove the wreckage and clean up the debris. For both incidents, the TMC coordinated the communication between local authorities, sent HERO units to the scene, and posted CMS messages.
- **TRANSIT SYSTEMS OPERATIONS**
  - Transit operations proceeded smoothly today. No significant incidents were reported and delays were at a minimum.
- **TCC OPERATIONS**
  - No report today about TCC operations.
- **SPECIAL ACTIONS**
  - No special actions today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Thursday, August 1,1996

- **FREEWAY and TMC OPERATIONS**
  - GDOT and GSP continued implementing the traffic management plan used since the beginning of the week. Rain in the morning delayed the rush and slowed traffic speeds. Congestion was similar to yesterday and there were many minor incidents.
  - Congestion on the southbound I-75/1-85 connector between Brookwood and Courtland St., was mostly moderate during the delayed morning rush and again during midafternoon. CMS messages were posted both in the morning and the afternoon on southbound I-75 and I-85 north of the I-285 perimeter advising motorists to avoid traveling through downtown. Heavy congestion on the I-75/85 connector in the Courtland St. area continued into the evening hours.
  - A serious incident near the I-285/1-85 interchange in the early afternoon caused heavy congestion in that area throughout the afternoon:
    - A tractor trailer ran off the I-285 westbound near the I-85 interchange in the early afternoon. Motorists traveling in the opposite direction slowed down to look at the accident and this caused heavy congestion. The TMC posted CMS messages and sent a HERO unit to assist with clearing the incident. The TMC also called for aerial surveillance to help assess the situation. TMC coordinated the efforts of GDOT maintenance crews and private wreckers to clear the incident. All lanes of the westbound traffic were stopped temporarily to remove the tractor trailer but were quickly reopened, except for the rightmost lane. The incident was completely cleared after about 3 h.

Olympics Event Study
Daily Summary for Thursday August 1,1996

- **TRANSIT SYSTEMS OPERATIONS**
  - Bus transit operations wrestled with heavy congestion downtown, but otherwise operated normally.
- **TCC OPERATIONS**
  - Fulton County TCC continued normal operations and is increasing its use and understanding of the implemented components of the ATMS.
  - Atlanta TCC continued testing the camera controls for the recently operational cameras. Contractor programmers continued to work on the signal timing software to implement the signal timing plans developed as part of the ATMS program.
- **SPECIAL ACTIONS**
  - No special actions today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Friday, August 2,1996

- **FREEWAY and TMC OPERATIONS**
  - GDOT and GSP again implemented the traffic management plan used since the beginning of the week.
  - Throughout the morning, traffic volumes throughout the system, and especially on the downtown section of the I-75/1-85 connector, were very light compared to previous days.
  - This afternoon and into the early evening, the north portion of the I-285 perimeter and the I-75/1-85 connector experienced the heaviest congestion since the Olympics began. On the perimeter, traffic was slow in the midafternoon from I-75 on the east to Stone Mountain Parkway (SR 78) on the west. By the early evening, the congestion extended from I-20 on the west to I-20 on the east.

    On the southbound I-75/1-85 connector in the early afternoon, congestion extended from the Courtland St. exit north to Brookwood. By the late afternoon, congestion extended to the I-85/GA 400 interchange.

    The TMC posted messages on the Changeable Message Signs advising motorists of the traffic congestion on the connector. The message and the message locations were updated as congestion worsened. The TMC also posted messages outside the perimeter to advise motorists to avoid using the connector through the city.

Olympics Event Study
Daily Summary for Friday, August 2,1996

- **TRANSIT SYSTEMS OPERATIONS (Continued)**
  - Very few incidents occurred, and those that did were minor stalls or accidents that did not affect traffic flow. HERO vehicles responded as needed to incidents, with no undue delays. The most significant incident was:
    - A three-car injury accident occurred in the early evening on southbound I-285 at Lawrenceville Highway, blocking the righthand lane. Cobb County Police responded to the incident.
- **TRANSIT SYSTEM OPERATIONS**
  - Delays continue at the intersection of Fulton and Windsor due to the signal timing pattern there that is unable to handle the large amount of traffic passing through. Spectator Communications and the MARTA TIC communicated the problem to the TMC and APD when it was first discovered two days ago. As of today, the intersection is experiencing the same delays.
  - There were no significant incidents involving the spectator transportation and MARTA transit systems today that affected the flow of traffic. However, a spectator bus was disabled in the gore at Spring St. after a minor accident that detached the mirror on the right side of the vehicle. While in the gore, the bus stalled and passengers were transferred to another spectator bus. The incident was detected on the CCTV by the TMC and was also observed on the Spectator Communications Center video monitor. The incident was cleared after the bus was serviced by a shop truck. Traffic was not blocked by this incident.

Olympics Event Study
Daily Summary for Friday, August 2,1996

- **SPECIAL ACTIONS**
  - The GSP stopped traffic for about 10 min in the late afternoon on the southbound I-75/ I-85 connector, to allow the vice presidential motorcade to pass. Although the closure occurred during a very congested period, no major disruption resulted.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Saturday, August 3,1996

- **FREEWAY and TMC OPERATIONS**
  - GDOT and GSP again implemented the same traffic management plan on the southbound I-75/1-85 connector between Brookwood and Courtland St. as has been used since the beginning of the week.
  - Throughout the morning, traffic volumes throughout the system were considered by TMC operators to be very light.
  - In the early afternoon, the southbound I-75/1-85 connector became congested, as on prior days. Messages were posted on all southbound Changeable Message Signs north of the connector. The messages outside the perimeter advised motorists to avoid using the connector. Inside the perimeter, the messages advised of the congestion and the extent of the backup.
  - Although there was a series of incidents and accidents from midmorning onward, none except the following incident affected travel lanes:
    - An injury accident involving two cars and a tractor trailer partially blocked northbound I-285 on the west side near US 78. This accident was first detected by speed reductions recorded by the radar system, and was subsequently verified using a showcase CCTV camera. Messages were posted on Changeable Message Signs, although the signs were located some distance to the south. A HERO vehicle was dispatched to assist emergency services at the scene.

Olympics Event Study
Daily Summary for Saturday, August 3,1996

- **FREEWAY and TMC OPERATIONS (Continued)**
  - An incident occurred last night after the summary report deadline.
    - On the southbound I-75/1-85 connector at 14th St., there was a five-vehicle injury accident that involved an ACOG bus. This was detected via the CCTV cameras. GDOT enforcement and HERO units responded and TMC posted advisories on Changeable Message Signs. The two leftmost lanes were closed at first. After the ambulance left the scene, one lane was reopened until the accident was finally cleared.
- **TRANSIT SYSTEMS OPERATIONS**
  - There were no significant incidents involving the spectator transportation and MARTA transit systems today that affected traffic flow.
- **ATLANTA TCC OPERATIONS**
  - There was little traffic congestion during the morning hours on streets monitored by the Atlanta TCC. However, volumes became quite heavy in the early afternoon. Despite the congestion, there were no significant incidents.
- **SPECIAL ACTIONS**
  - No special actions today.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

Olympics Event Study
Daily Summary for Sunday, August 4,1996

- **FREEWAY and TMC OPERATIONS**
  - On this last day of the Olympics, GDOT and GSP again implemented the same traffic management plan that has been used since last Monday on the southbound I-75/1-85 connector between Brookwood and Courtland St. In the afternoon, this plan was modified to facilitate athlete bus entrance to the connector. The modification involved lifting the lane closure at the Spring St. on - ramp and closing a lane of the southbound connector at the 10th St. on - ramp.
  - Yesterday evening, after a meeting during the day between transportation organizations, including GDOT, MARTA and ACOG, the TMC initiated a traffic management plan to improve bus traffic flow between the Park & Ride lots and the downtown staging areas. Using the authority of the Commissioner of Transportation, the TMC closed the HOV lanes to all but bus traffic. Changeable Message Signs and commercial radio broadcasts informed motorists of this change in the traffic pattern. The TMC estimated that there was only a 25 percent violation rate in the HOV lanes during the evening hours. The effect of this plan on bus operations is unknown.
  - Throughout Sunday morning, traffic volumes throughout the system were very light and there were no significant incidents. Traffic throughout the system remained light to moderate in the afternoon and early evening, with no significant congestion.
  - There were no significant incidents during the day.

Contacts for this report: Sam Subramaniam (pager 404/318-5262)
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Olympics Event Study
Daily Summary for Sunday, August 4,1996

- **TRANSIT SYSTEMS OPERATIONS**
  - Due to the light traffic and the reduced Olympic events schedule, there were no significant incidents involving the spectator transportation and MARTA transit systems today.
- **TCC OPERATIONS**
  - No report today on TCC operations.
- **SPECIAL ACTIONS**
  - Traffic on the I-75 and the connector was halted briefly in the late morning hours to allow the vice-presidential motorcade to travel from Dobbins AFB to the downtown area. Although traffic had started to build on the connector, no significant delays resulted from the brief halt.
- **ADDITIONAL COMMENTS**
  - No additional comments today.

APPENDIX B
ATLANTA TRAVELER INFORMATION SHOWCASE (TIS) USER ASSESSMENT

The assessment of the Atlanta TIS is the subject of a separate report prepared by the Battelle Memorial Institute. The following is a summary, provided by Battelle, of the main findings.

The overall objective of the TIS user assessment was to understand the value of the traveler information provided through the TIS, from the perspective and experience of the user. The primary focus of the TIS was to provide travelers with an opportunity to experience advanced traveler information systems. A related objective was to demonstrate that a set of technologies could be successfully integrated with a transportation management system to provide travelers with accurate, real-time information to assist with their trip planning and on-the-road travel decisions.

A user assessment was added to the TIS program because of the recognized value of gaining a better understanding of how the user viewed this system and its technology components. The TIS also desired to obtain user feedback to help guide system improvements, in real time within the constraints of time and resources, and for long-term applications to other ITS deployments. The TIS user assessment was conducted by Battelle Memorial Institute, and the findings presented in this appendix were obtained from Battelle for inclusion in this report.

As part of the TIS effort, federal, state, and local transportation agencies teamed with private-sector partners to introduce real-time traffic, transit, parking, and other area information to residents and visitors in the Atlanta area, from June 1 through September 30,1996. This included the period of the Olympic and Paralympic games. The TIS offered this traveler information through five technology groups:

- **Internet:**
  - **Transportation page,** presenting information about, or gateways to, real-time traffic, public transit, parking, wide-area travel, route planning, and freeway map.
  - Services **page,** presenting information about, or gateways to, restaurants, lodging, movies, weather, bus routes and schedules, rail stations, parking lots, and a link to the Atlanta Convention and Visitors Bureau web site.
  - **Special Events page,** presenting links to several web sites, including: official Olympic Games, Olympic Arts Festival, Paralympic Games, AJC Olympic Report, and other Atlanta special events.

  - **Points of Interest page,** presenting links to other web sites, including Atlanta Area Attractions and other sites.
  - **ITS On-Line web site.**
  - **Atlanta Project (Showcase)** page, presenting a description of the Atlanta TIS project.
- **Cable TV (Georgia Traveler Information Television):** Available to 700,000 households in the Atlanta metropolitan area.
- **Interactive TV:** In selected hotel bedrooms (285 rooms in the Crowne Plaza Ravinia Hotel in Atlanta), permitting users to interact with their in-room television using the remote control. A map-printing option was also available.
- **In-vehicle navigation systems** (96 units): Installed in selected Hertz rental vehicles, and made available to selected FHWA staff, Olympic staff, VIPs, and area employers.
- **Personal communications devices** (222 units): Hand-held computers which incorporated two-way paging technology.

Similar to the Booz.Allen & Hamilton assessments of the various ATMS, ATIS, APTS, transit systems, and HOV components described earlier, this assessment conducted by Battelle also focused on obtaining a high-level understanding of the user perceptions of the various TIS systems.

Given the limited scope of this assessment, the relatively **small sample sizes, and** the self-selection of respondents in the study of user reactions to the TIS, the results **should be interpreted with** care. They should be viewed as suggestive user **reactions,** rather than representative responses of a larger population of travelers or device users.

There were 755 respondents to the user assessment across all the technologies. The average age of all respondents was 42 years, 72 percent were male, and 76 percent were highly educated, with a college degree or higher. The majority of respondents, 56 percent, were Atlanta residents. Over 80 percent of respondents reported that they had some or a lot of experience with computers. About one-third of the respondents reported that they used these traveler information technologies for travel assistance during the Olympic or Paralympic **games.**

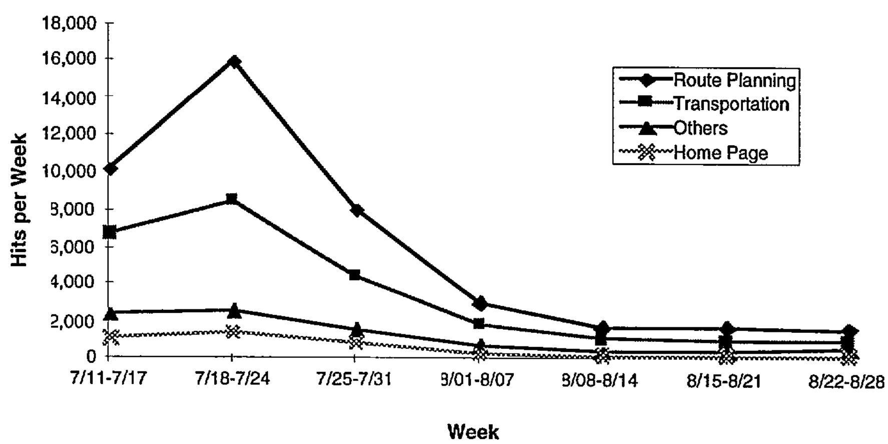
A summary of the findings of the user assessment is presented in this section, for each of the TIS technologies.

Internet

The Internet site (www.georgia-traveler.com) home page provided information about Atlanta and the games. The home page had direct links to six other web pages:

- **Transportation page,** presenting information about, or gateways to, real-time traffic, public transit, parking, wide-area travel, route planning, and freeway map.
- **Services page,** presenting information about, or gateways to, restaurants, lodging, movies, weather, bus routes and schedules, rail stations, parking lots, and a link to the Atlanta Convention and Visitors Bureau web site.
- **Special Events page,** presenting links to other web sites, including: official Olympic Games, Olympic Arts Festival, Paralympic Games, AJC Olympic Report, and other Atlanta special events.
- **Points of Interest page,** presenting links to other web sites, including Atlanta Area Attractions and other sites.
- **ITS On-Line web site.**
- **Atlanta Project (TIS) page,** presenting a description of the Atlanta TIS project.

Figure B-1 presents the number of visits (hits) to the home page, the transportation page, and the route planning page (accessed from the transportation page). The number of hits on other pages is summarized under the heading "others." The most popular page was consistently route planning, with a peak of over 16,000 hits during the first week of the Olympic Games. The second most popular page was transportation, which followed a similar pattern to route planning, but at approximately half the rate. By the end of the Paralympic Games, the hit rate for all pages, on average, was approximately one-tenth of that during the first week of the Olympic Games.



Source: Battelle Memorial Institute, Transportation Division

FIGURE B-1. Summary of Internet Hits

The assessment of this technology differed from the others in that the questionnaire was incorporated into the web site so that users could respond directly and submit their responses electronically. Initially, a link to the questionnaire was placed at the bottom of the home page. Later, based on evidence that many users were going directly to the site subsections of interest to them, additional links to the questionnaire were inserted on those more popular transportation-related pages. Survey responses were received via electronic mail by TIS staff, for database storage and analysis. TIS logo polo shirts were offered as incentives to respondents of the web site questionnaire. The TIS program made substantial efforts to advertise the availability and location of the web site through published articles, direct contacts with other Internet providers, and registration with web search services.

Over the 4-month TIS test period, 272 Internet users responded to the web site questionnaire. While it is known that about 1.3 million pages were accessed during this period, it is difficult to estimate the number of pages accessed per site visit, or the number of repeat visits over the 4 months. Therefore, only a rough estimate of the number of unique web site visitors is possible, suggesting a response rate of around 5 percent.

Figure B-2 shows the weekly response pattern for the web site. The period of heaviest response to the questionnaire corresponds with the period of the Olympics, from July 19 to August 4,1996. This also corresponds with the most pages accessed at the TIS web site. The figure distinguishes first-time visitors to this site from those who reported more than one visit during the previous week. The earlier period reflects mostly first-time visitors, and the later period has more repeat visitors. Very few respondents to the Internet questionnaire responded to the assessment more than once. The average number of reported visits for repeat site visitors was 6.2 times during the previous week. The total number of visits for repeat visitors over the $-month TIS test period was probably large, though this cannot be determined from the data available.

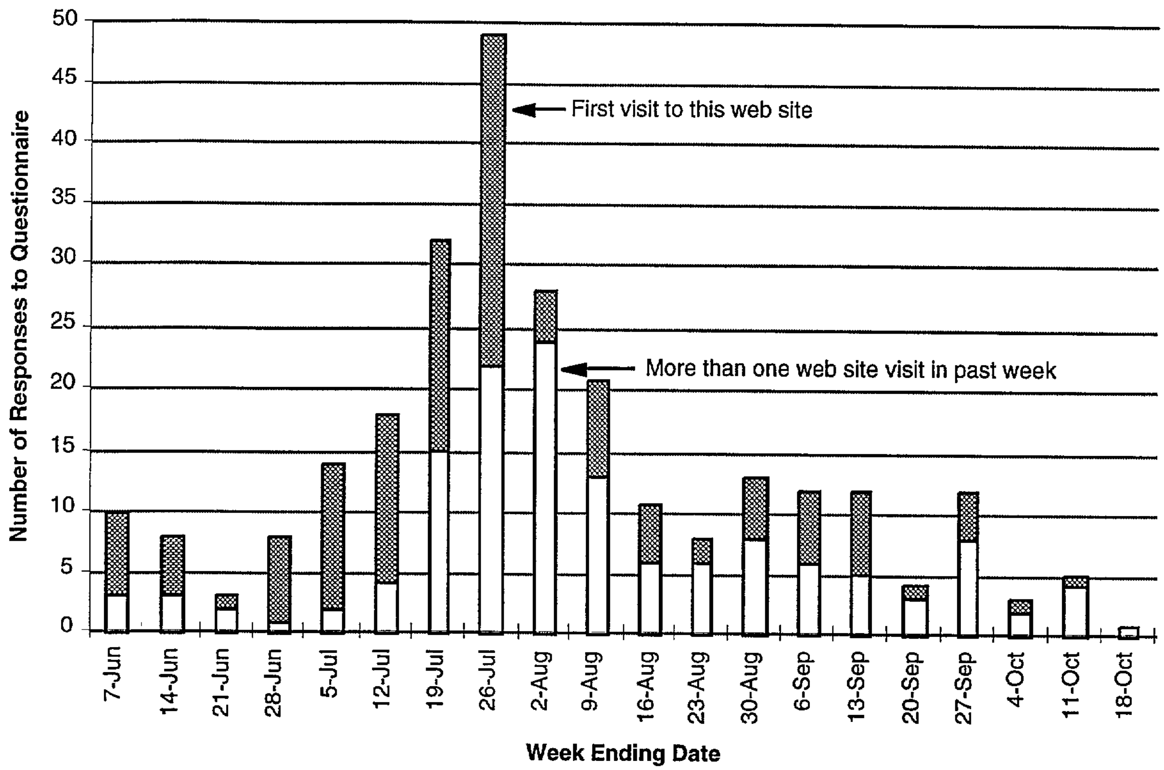


FIGURE B-2. Weekly Responses to the TIS Internet Web Page

Internet respondents were asked to rank the usefulness of the main topical areas accessible on the home page, including transportation, services, special events, points of interest, TIS overview, and ITS web page links. The transportation page was clearly the most visited and most useful component of the site, with over 94 percent of respondents visiting this area and about 85 percent reporting that it was somewhat or very useful. Roughly half of these respondents did not even visit the other pages.

The transportation subareas included public transit, real-time traffic, parking, wide-area travel, route planning, the Atlanta freeway map, and the Olympic transportation area. Real-time traffic conditions were noted as the most useful subarea by those who visited the site; over 75 percent of these respondents indicated that the information was somewhat or very useful.

Transit information was evaluated as useful by those who visited the transit subarea, though only 57 percent of the respondents visited it. Only about half of all the Internet respondents said they visited the parking, wide-area travel, route planning, or Olympic subareas. About 70 percent visited the Atlanta freeway map subarea, and 87 percent of those said that the area was somewhat or very useful.

Respondents reported that traveler information was most likely to influence routing behavior and least likely to influence destination or mode changes. More than with any of the other technologies, Internet users were most likely to say that the traveler information they obtained would cause changes in travel plans or decisions. Many Internet users reported that they visited the site in the morning and/or evening and patterned their commutes based on the information they obtained.

Of the 272 respondents to the Internet site questionnaire, 60 percent provided comments or suggestions. Users welcomed the existing features, but they wished for new improvements, and they have offered many specific suggestions. The most frequently requested improvement was to add real-time camera shots for key locations on the freeway system.

In-Vehicle Navigation Device

One-page written questionnaires, printed on the front and back, were prepared for each of the other technology users, including the in-vehicle device users. Packets were made up that contained sets of questionnaires, return envelopes, and a short notice about becoming eligible for prize drawings by completing and returning a questionnaire. Each packet contained about a dozen questionnaires and a set of user instructions. These were placed in the glove compartments of the equipped vehicles. A notice was affixed on the front of the dashboard of the vehicle, informing the driver about the assessment. Users were instructed to fill out the questionnaire and either leave it with the person to whom they returned the vehicle or mail it in the postage-paid envelope included in the packet.

Hertz personnel were responsible for assuring that the glove box always contained a sufficient backlog of questionnaire packets, and for checking the vehicle for returned questionnaires when the vehicles were returned. Vehicles that were made available to FHWA, Olympic staff, VIPs, and area employers were handled in a similar way. Persons managing the distribution of the in-vehicle navigation device, other than Hertz, agreed to see that a questionnaire was completed and returned separately by each driver.

A total of 96 in-vehicle units were made available to both Atlanta residents and visitors. Over the 4-month period, 75 questionnaires were returned. Based on estimates of the number of drivers who had the opportunity to try out these devices and respond to the questionnaire, the actual returns reflect about a 10 percent response rate.

It was observed that navigation units in the Hertz cars were likely used for only a few days each, while those assigned to VIPs and others in the Atlanta area were used for much longer periods by a single user. The overall average was **15.5** days of use by the 64 respondents who returned completed responses.

Seventy users reported frequency of use; they used the device for navigation an average of 3.2 times per day. All but one of these said they used the device to access route planning information (98.6 percent). Sixty percent said they used the device to obtain information on traffic conditions. About 51 percent accessed yellow pages information, and less than 25 percent of users accessed parking, transit, or Olympic/Paralympic information.

Users were asked to assess 14 different indicators of “level of perceived benefit” for the in-vehicle navigation device. Responses indicated a high level of agreement, reflecting strong endorsement of this device and the traveler information provided. The lowest ranked attribute was neutral, that is, only 32 percent of respondents agreed that they got traffic information when they needed it, and 52 percent were neutral on the question of timeliness of traffic information. Although 45 percent of the in-vehicle users reported experiencing some kind of problem with the device, this did not appear to have any significant effect on their positive evaluation of the benefits.

All the respondents who offered comments on the usefulness of the device said that the device was somewhat or very useful for route planning-the majority said that it was very useful. Endorsement of the other categories was not as strong, with about half of the respondents indicating that current traffic conditions and yellow pages information was somewhat or very useful. Only 14 percent endorsed transit information obtained in this manner.

Respondents were queried on the in-vehicle device’s influence on either their travel plans or travel decisions. Although all the respondents said that route planning was useful, only 57 percent of respondents said they actually altered their travel behavior with regard to routing. Presumably others used the device to confirm a route they planned to take anyway, or the device served to enhance their confidence in the route they chose. Perhaps the device prevented them from straying off their route. Respondent users of the device rarely changed the timing or mode of their travel. Overall, 37 percent of these respondents said they made no changes at all as a result of the information they obtained from the device.

Personal Communication Devices

In exchange for the opportunity to try out either of two hand-held devices, the Motorola Envoy or the HP 200LX users agreed to complete and return a written questionnaire. In most cases, individuals assumed responsibility for the device, as well as for the completion and return of the questionnaires. Generally, the plan was to complete the questionnaires and return them at the end of the period of use. TIS staff contacted the device distributors periodically and picked up completed questionnaires; however, most questionnaires were collected when the devices themselves were picked up. This occurred twice, at the end of July and the end of September. It is likely that some users never received or knew about the questionnaire, particularly if their period of use was short. In cases where pickup was difficult, return envelopes were provided for completed questionnaires.

Hewlett-Packard managed the distribution of the 60 HP 200LX units. They conducted their own internal telephone follow-up with these users, and they also distributed the TIS written questionnaires to their user groups. Completed questionnaires were returned to the TIS office for analysis along with all the others.

A total of 222 PCD devices were made available to residents and visitors. Based on estimates of the actual numbers of users of these devices over the $-month TIS period, response rates to the user assessment are estimated to be between 30 and 40 percent. The 106 Envoys and 116 HP 2OOLXs were used by these respondents an average of about a month (32 days for the Envoys and 27 days for the HPs) The average use was 4.7 times a week for the Envoys and 6.1 times a week for the HP devices. The top two types of traveler information accessed by the users of both devices were: current traffic conditions, and route planning. Less than 50 percent of the respondents used the devices for information related to parking, transit, Olympic events, or wide-area travel.

Users were asked to evaluate 15 different indicators of level of perceived benefit of the two hand-held devices. With each statment, respondents checked one of five boxes, ranging from strong agreement to strong disagreement. Results for the two assessments on the hand-held devices are remarkably similar to each other on every one of these levels of perceived benefit, or device attribute/function, with predominately neutral responses to these indicators.

Users liked the hand-held devices as a way to present traveler information, and they generally found the devices easy to use. They endorsed the accuracy and helpfulness of the information provided; 44 percent of Envoy users and 45 percent of HI? users said that the information was helpful for trip planning. Users were apparently not likely to decide to purchase a device for their own use, assuming a reasonable (unspecified) price; only 28 percent of Envoy users and 36 percent of HP users said they would consider such a purchase.

Users were asked to comment on any problems encountered in using the traveler information devices. Over half of the 40 HP users and 57 Envoy users who reported having problems indicated that they were related to communications. Only 21 percent of Envoy users and 30 percent of HP users said that sending and receiving messages worked well.

Seventy percent of HP users and 60 percent of Envoy users who reported having no problems with the device said the traveler information was helpful for trip planning; this was more than double the result for those who reported having problems. Also, for those users who did not report problems, 52 percent of HP users and 42 percent of Envoy users said they would consider purchase of the device for personal use at a reasonable price. This was substantially more than the proportion of those who reported problems and said they would consider purchase. The conclusion is that the experience of problems significantly impacted the perception of benefit among this group of users.

Between 50 and 70 percent of both Envoy and HP users reported that current traffic condition information was either somewhat useful or very useful. Between 50 and 55 percent reported that it was useful for route planning. Thus, even though they sometimes experienced communications difficulties obtaining this information, the information they did get was generally seen as useful. Wide-area travel was rarely accessed and was judged not very useful by those who did access it. The other categories fell in between in terms of reported usefulness.

Another area of interest was the extent to which access to traveler information from the hand-held devices influenced trip planning and actual travel behavior decisions. The two hand-held devices exhibited almost identical results in this regard. About 40 percent of respondents reported that they changed trip routing, and about 18 percent changed trip timing. Almost none of these respondents changed destination or mode of travel. About 60 percent said they made no changes in travel behavior as a result of the information they received.

It is important to recognize that, for these hand-held devices, as well as for the other' technologies, the question that produced these responses only asked if the information ever once produced the behavioral effect. The average hand-held user who **had the device** for a month presumably used it many times, yet even if they said they changed routing only once, they are listed in that response category. The data do **not reflect** how often they made each change. Therefore, caution is needed in interpreting the strength of this apparent effect. However, the fact that over half of all hand-held device users said they made no changes in travel plans or decisions, regardless of how many times they used the device, appears to be an important finding.

Cable TV

Cable TV represented the greatest challenge with respect to identifying viewers of the TIS channel. Difficulties were encountered in getting questionnaires into their hands and receiving completed forms back. Several different approaches were used. First, cable TV viewers who called into the TIS hot line were asked whether they would be willing to fill out and return a questionnaire. Those who agreed were sent questionnaires with postage paid return envelopes.

Second, the four local county governments and the city of Atlanta, who provide public access to public services cable TV channel(s), were contacted to explore ways of surveying samples of their local cable TV viewing constituencies. Cobb County agreed to include a short article advertising the TIS cable channel in their July monthly flyer, which was included with the water bills of approximately 120,000 customers. The article encouraged viewers to call the hot line with their comments and also mentioned the Internet site. Third, a script was developed for inclusion with the TIS broadcasts. In part, it read "We need your feedback. Please, give us a call at [hot line number]. Just fill out a short comment form and you will be eligible to win...." Fourth, extensive negotiations took place with Media 1, a major cable TV franchise in the area. The intention was to work with Media 1 to distribute a small-scale random sample survey to their customers. Unfortunately, an agreement was never reached with Media 1 and this strategy was abandoned.

Finally, prior to the commencement of the TIS test period, selected employers in the Atlanta area were sent a flyer with information about the program, including the cable TV and the Internet site. In early September, each of these employers was contacted and asked if they would be willing to distribute cable TV questionnaires to their employees. Most agreed, and 1,570 questionnaires were distributed with postage paid return envelopes. These were sent to the employers under a cover letter explaining the objective and encouraging each employer to distribute them to employees under a company letterhead. The TIS provided draft language for these internal cover memos. It was recognized that some portion of employees receiving these assessment forms would not have cable TV in their homes. Also, this was clearly not intended to constitute a random or representative sample of cable TV viewers.

Seven-hundred-thousand cable TV viewers in the Atlanta area had access to the TIS system, **but less** than 1,400 of them are estimated to have received a questionnaire. Most did not have a chance to respond to the TIS user assessment. The 61 **viewers who did** return a completed questionnaire reported an average use of 4.6 times per week of the TIS public access channel. All but one of the respondents were Atlanta residents.

The respondents evaluated 11 different indicators of level of perceived benefit associated with the technology itself, or with the traveler information provided by it. Several questions asked were unique to the cable TV technology, so comparisons on some of these dimensions with the other technologies cannot be made. Response patterns are quite consistent across the different indicators, reflecting mild agreement on most of them.

The effect of the traveler information obtained through cable TV on travel planning and decisionmaking was similar to that for the Internet Web site, i.e., respondents reported weaker effects than that for similar information from the Internet. About 33 percent of the cable TV respondents reported no changes in their travel behavior based on the information provided.

The cable TV questionnaire asked a unique question not presented to respondents of any of the other technology assessments. It said, "Briefly describe what information you found particularly useful that you obtained from the traveler information broadcasts on your cable TV." Responses to this question were provided by 44 out of the 61 survey respondents. The following is a summary of the kinds of attributes of the cable TV system that users found particularly useful:

- Location-specific traffic conditions.
- Details on incidents, alternate routes, trouble-area maps, construction areas.
- Traffic volumes, average speeds, flow, congestion.
- Real-time camera views.
- Voice-overs that enhanced video images.
- Ability to view different locations.
- Presentations that were easy to understand.
- Early morning timing of program.

Interactive TV

TIS interactive TV was provided to 285 out of 495 rooms in the Crowne Plaza Ravinia Hotel in Atlanta. Given the very large number of hotel guests expected over the $-month TIS period, it was decided early to distribute questionnaires to hotel guests every other week, for a total of 9 weeks, 7 days a week. Initially, the plan was to provide a questionnaire and postage paid return envelope with the guest's bill, slipped under the hotel room door on the day of,check-out. The guest could leave the completed form in the room, drop it off with the concierge or front desk, or take it with them and either mail or fax it back. This approach **was not very successful.** As a result, the procedure was changed to distribute the questionnaire materials at the time of guest check-in. This approach was much more successful.

During the Olympics, special group check-in procedures were used, and the questionnaire distribution process was adversely effected. In part because the hotel was changing over the entire TV system in their rooms, they decided to discontinue the provision of TIS, and all the equipment was removed from the hotel one month prior to the end of the TIS period. Throughout this period, TIS staff visited the hotel periodically to collect the biweekly questionnaires that had been returned by guests. A total of 178 questionnaires were returned by guests, an estimated response rate of about 12 percent.

Over 60 percent of the guests who returned questionnaires reported that they did not use this service at all. Many of the reasons are readily understandable:

- Lack of time to watch any TV.
- Attendance at a conference that didn't require them to leave the hotel.
- Not aware of the service.
- Problems with the service.

In addition, especially during the Olympics, guest stays and travel were organized by company groups. Based on data on the total number of recorded uses of the TIS system in the hotel, it is estimated that probably no more than 25 percent of all the guests who had the service in their rooms actually used it during their hotel stay.

The average length of stay by respondents was 2.7 days, slightly longer than the 2-day average stay estimated by the Crowne Plaza Hotel. The average reported use of the Interactive TV for accessing TIS traveler information was 2.3 times, for users who answered that question. The most accessed kinds of information by these users were: weather (67.6 percent), and area attractions and restaurants (66.2 percent). Slightly over half of these respondents said they accessed information on current traffic conditions and/or route planning. About 25 percent of the respondents who used the system reported that the map printing option was somewhat or very useful. Only 19 respondents reported that they tried this printing capability.

Respondents evaluated 13 different indicators of level of perceived benefit provided by the Interactive TV. These responses cluster in a very similar pattern to the comparable responses from cable TV viewers, and they reflect mild agreement on most of the indicators. About 44 percent of the respondents said they would consider purchasing a similar capability for their home TV for a reasonable cost when it becomes available.

Information on current traffic conditions and route planning were reported somewhat or very useful by 47 percent of respondents who used the system. About 40 percent said the same for transit information. The remaining options were rated less useful. Unlike any of the other technologies, fewer than 20 percent of users of this service reported that access to the information altered their travel planning or behavior. About 58 percent of respondents reported that the information had no effect on their travel plans or decisions. Given an estimated 25 percent overall use rate for the hotel system, this reflects a very small effect on travel behavior.

Comparative Assessment

The TIS user assessment illustrates the complex nature of benefits evaluations for a group of traveler information technologies. The concept of benefits is multidimensional, i.e., no one measure can capture a full sense of the benefit of these alternative technologies. Users see benefits to a greater or lesser degree both in the technologies (devices) themselves and in the traveler information provided through the devices.

Users react to many attributes of both the technology and the information, and this user assessment has tried to measure some of these reactions. Components of benefit include:

- Ease of use and comfort with the devices.
- Human factors aspects of the information presentation.

- Convenience of access to information.
- Reliability and accuracy of the information.
- Perceived usefulness of the information obtained.
- Functionality of linked support structures (such as the wireless communications system, or the fixed-end server).
- Utility and effectiveness of the information in altering travel behaviors.

This short user assessment examined many of these benefit dimensions, though it was not possible to probe in any depth into user responses to gain a more thorough understanding.

This appendix offers some selected comparative data across several of these dimensions, though users were never asked to compare these technologies directly. Figure B-3 shows how respondents independently ranked each technology on several of the indicators of perceived benefit. Not every technology is included in every indicator, since each question was asked for only some of the six technologies. The data points on the graph represent the mean (average) response over all respondents to each question. Strongly agree is a 5 and strongly disagree is a 1. A mean score of 3.5 or above can be interpreted as reflecting agreement with the statement, and a higher score indicates a stronger level of agreement. Points between 2.5 and 3.5 reflect a neutral response, though this may reflect a balance between agreement and disagreement among respondents.

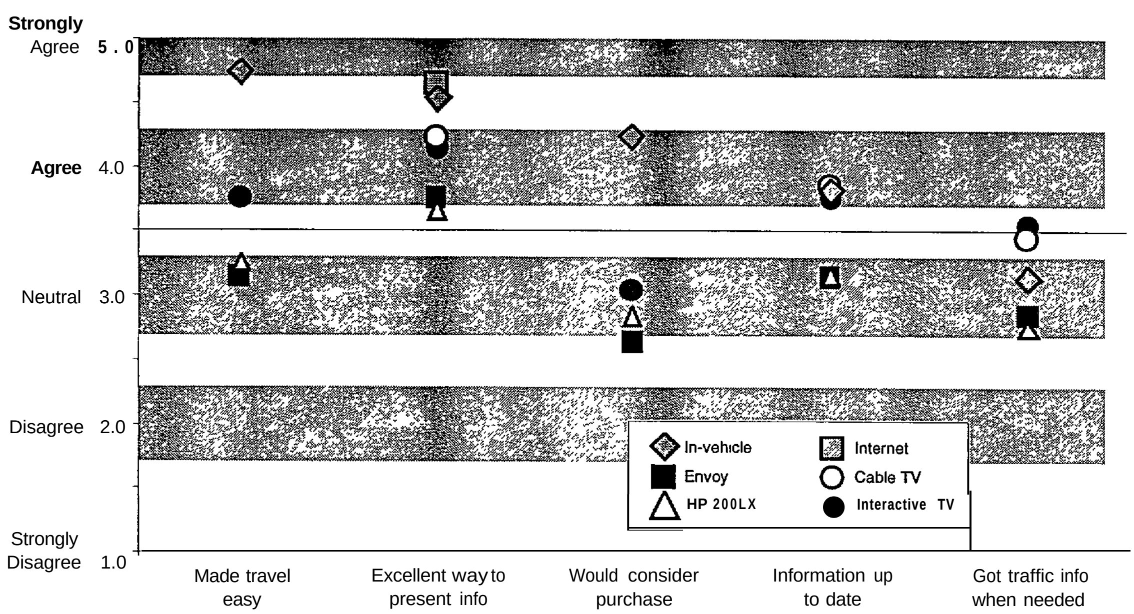


FIGURE B-3. Perceived Benefits of TIS Technologies

The pattern of results shows that the in-vehicle device was generally ranked the highest on these kinds of benefit indicators. Also, the two hand-held devices were perceived to offer less benefit compared with the others. The remaining technologies fall in the middle between these two sets. However, it is important to note that the average evaluation of degree of benefit on each technology across the full set of indicators ranges from neutral to strong agreement. On some of these measures, there is more uniformity of agreement than on others. For example, getting traffic information when needed is important for the success of a system like this. For this TIS trial period, this attribute was not ranked particularly high by respondents to any of the technologies. This may reflect some of the communications problems users commented on, rather than an evaluation of the device per sé.

The reported usefulness of the information derived from these technologies is another important indicator of benefit. As shown in Figure B-4, this indicator conveys a somewhat different picture of the perceived benefits of the TIS than the previously discussed set of measures. The most notable result is the 100 percent of the in-vehicle device survey respondents reporting that route planning was somewhat or very useful, whereas the responses on the other surveys fall in the 35 percent to 55 percent range. Information on current traffic conditions (real-time information) is generally perceived as quite useful across the technology groups. Interestingly, in-vehicle respondents rated this indicator lowest, at 50 percent. Each of the other information categories was ranked somewhat or very useful by no more than half of the respondents. The Internet respondents evaluated the usefulness of the traveler information they obtained on the web site as generally higher than the other technology users.

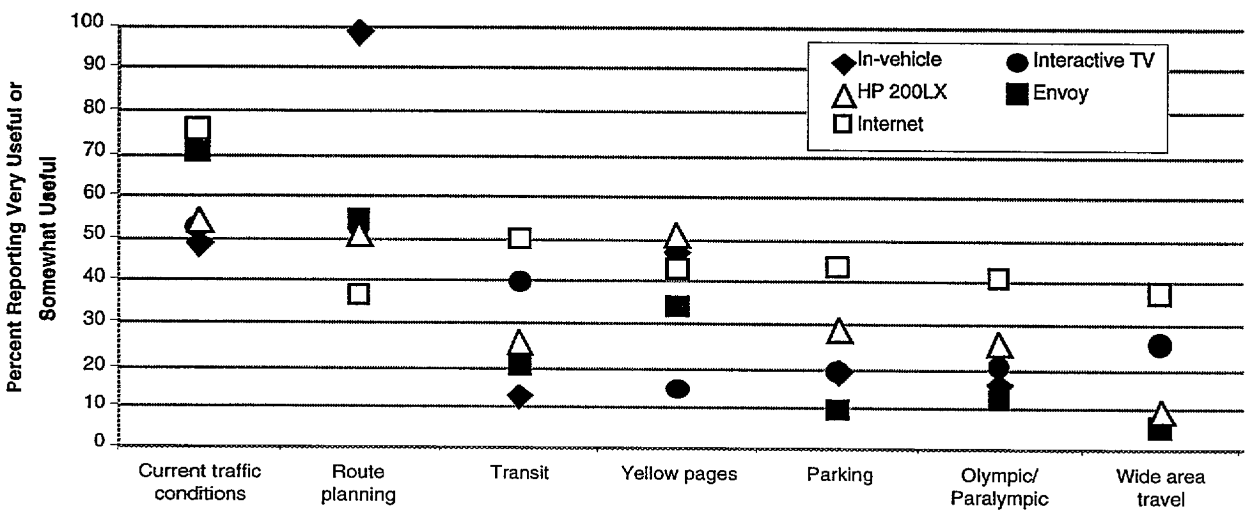


FIGURE B-4. Reported Usefulness of Selected Traveler Information Categories

As a further comparison across technologies, Figure B-5 shows the percent of respondents on each assessment who said they made one or more changes in travel plans or decisions as a result of access to the TIS information. Internet respondents are evidently more likely than users of the other technologies to change their travel plans or behavior as a result of the information they obtain through the TIS program.

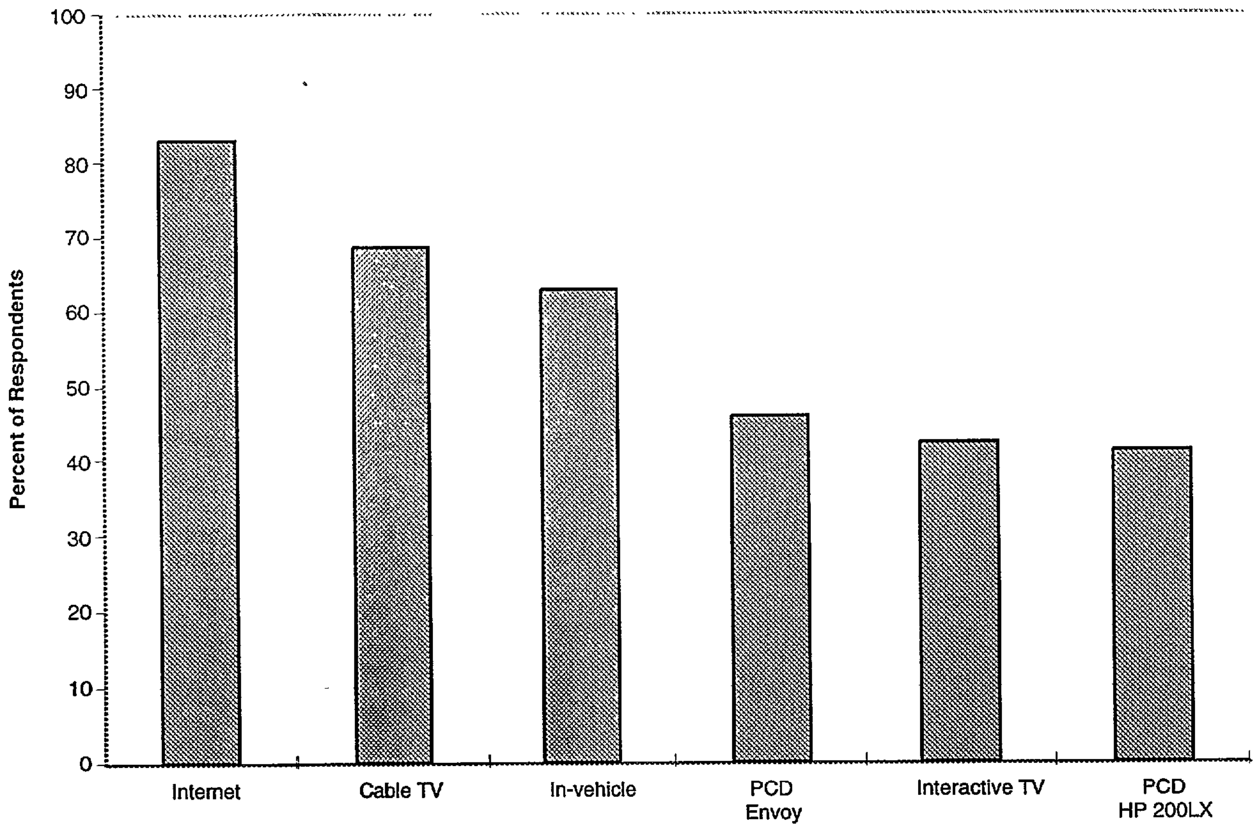


FIGURE B-5. Percent of Respondents Making One or More Changes to Travel Plans or Decisions, by TIS Technology